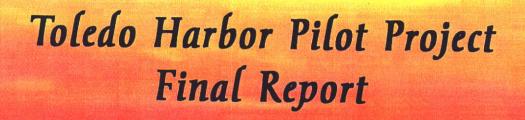
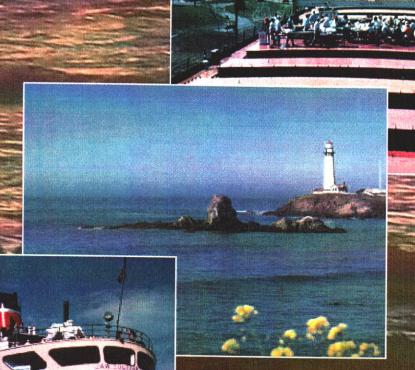
Sediment Source Reduction

APPENDIX C1
USDA CROP RESIDUE MANAGEMENT



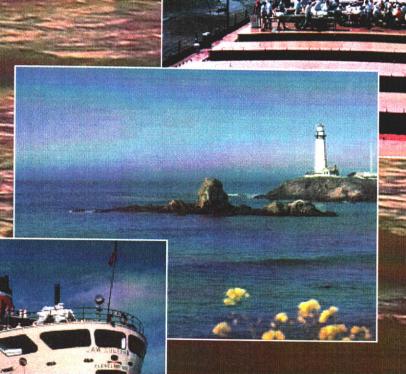
November 1998



United States Department of Agriculture Natural Resources Conservation Service



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TOLEDO HARBOR PILOT PROJECT

FINAL REPORT

Table of Contents

	Executive Summary	i - ii
1.	Introduction	1
2.	Toledo Harbor Project Background	3
	Long Term Management Study Agricultural Sediment Reduction Goal	
3.	The NRCS Agricultural Sediment Reduction Project	. 5
	Toledo Harbor Sediment Reduction Overview Soil Conservation Goals Soil Conservation Project Funding	
4.	NRCS Pilot Demonstration Project	9
	Methods Used for the Project - County Sediment Committees & Locally Led Strategies Grants to Carry Out Strategies	
5.	County Sediment Reduction Activities	12
	Incentive Programs for Landowners - Vegetative Cover Incentives - Conservation Tillage Incentives - Structural Incentives - Innovative Ideas Developed Demonstrative Programs Developed & Funded	
	 Conservation Tillage Demonstration Programs Wetlands as Sediment Traps 	
	Information & Education Activities	

6.	Accomplishments Of County Sediment Reduction Activities
	Partnerships Developed Leveraging of Corps of Engineer Funding Effective Use of Sediment Reduction Grant Funds
7.	Measures Of Progress For Project Period
	Measurements of Conservation Tillage Trends Lake Erie Agricultural Systems for Environmental Quality Study Gross Erosion Estimates Cost Effectiveness of Soil Conservation Project - Ohio State University Economic Analysis
8.	New Opportunities For Sediment Reduction
	Conservation Buffer Initiative - Conservation Buffer Analysis for Maumee Watershed - Buffer Analysis Model and Assumptions - Buffer Analysis Findings Sediment Modeling and Source Identification - Water Resources Development Act - U. S. Geological Survey NOWAQA Studies
9.	Project Evaluation45
10.	Future Recommendations. Continue County Sediment Reduction Program Accelerate the Conservation Buffer Initiative Establish a Toledo Harbor Trust Fund Funding Recommendations
11.	Project Conclusions
12.	References 65
12	Annendices 66

LIST OF PICTURES

Picture 1	Agricultural landowners view dredge in operation in Toledo Harbor	2
Picture 2	Erosion on flat crop fields in the Maumee River Watershed	5
Picture 3	Grass filter strips trap sediment and filter runoff water	13
Picture 4	No-till farming protects soil from erosion with residue cover	14
Picture 5	Conservation tillage field day	18
Picture 6	Wetland sediment trap	19
Picture 7	Sediment committees tour Toledo Harbor	20
	LIST OF CHARTS	
Chart 1	NRCS utilization of Corps of Engineers Funds	10
Chart 2	Funds expended within the Toledo Harbor Project	23
Chart 3	Utilization of grant funds by sediment committees	24
Chart 4	Conservation tillage trends in Toledo Harbor Counties (Ohio)	28
Chart 5	Conservation tillage trends in section 319 targeted counties versus non targeted counties	29
Chart 6	Conservation tillage trends in CAP versus non-Cap counties	30
Chart 7	Progress towards sediment reduction goal	33
Chart 8	Impact of conservation tillage and buffers on sediment reduction	37
Chart 9	Combinations of buffer and conservation tillage amounts that would achieve the Soil Conservation Program goals	38
Chart 10	Changes in sediment reductions due to differing levels of	39

LIST OF TABLES

Table 1	Toledo Harbor Project Advisory Board	11
Table 2	Types of Toledo Harbor Project Partners	21
Table 3	Organizations Serving As Partners On County sediment Committees	22
Table 4	Long Term Record of Water And Sediment Discharge at Waterville Gauge	26
Table 5	Recommended funding for Soil Conservation Program	59
	LIST OF FIGURES	
Figure 1	Conceptual view of flat field with filter strip serving	40
Figure 2	Conceptual view of wetland/sediment basins as conservation buffers in areas of sloping topography	41
	APPENDIX	
Appendix 1	Erosion and Sedimentation Dynamics of the Maumee River Basin	
Appendix 2	Contract with Maumee Valley RC&D Council to Monitor Sedimentation of Wetlands	
Appendix 3	Lake Erie Agricultural Systems for Environmental Quality Study	
Appendix 4	Analysis of Conservation Buffer Effectiveness for the Toledo Harbor Project	
Appendix 5	Comments and Evaluations from Toledo Harbor Project County Steering Committees	

TOLEDO HARBOR PROJECT

FINAL REPORT

EXECUTIVE SUMMARY

Each year, on the average, the U. S. Army Corps of Engineers spends approximately \$2.2 million to dredge 850,000 cubic yards of sediment from Toledo Harbor. The dredging is very costly and disposal of the dredged material creates environmental problems. Currently the material is disposed of either by confinement in disposal facilities, or by open lake dumping. These practices are expensive and/or environmentally sensitive.

An interagency study team has recommended a multi-part plan to reduce the dredging problem. One component of the plan is an extensive land treatment erosion control program to reduce the source of sediment. The goal for the agricultural component of the program is to reduce dredging by 130,000 cubic yards or 15%. In 1995 the Corps and the Natural Resources Conservation Service entered into a partnership and a two year pilot project to demonstrate the effectiveness of such an approach.

The pilot project provided \$700,00 in Corps of Engineers funding to NRCS. Funds were utilized provided to individual counties to develop locally led sediment reduction strategies and to implement sediment reduction activities. Over 22 counties in the Maumee Watershed participated. Counties used the funding to promote conservation tillage and other practices which would reduce sediment delivery to the harbor.

Analysis of conservation tillage trends for the project period showed that project counties had higher rates of conservation tillage than all Ohio counties. The analysis showed conservation tillage rates continued to increase within the project counties, at the same time they were leveling off or declining in non project counties. Based on increasing conservation tillage acres, the report predicts that sediment reduction is currently at 53% of the goals as compared to the 1992 base condition. Approximately half of the goal still remains to be achieved.

During the project period two independent studies were released which supported the project approach and cost effectiveness. The Lake Erie Agricultural Systems For Environmental Quality Study, by Heidleberg College and others, confirmed that increasing conservation tillage acres in the Maumee Watershed is resulting in decreased sediment concentrations in the Maumee River. An economic analysis conducted by Ohio State University projected that a 15% reduction in dredging would result in an annual savings of \$1.3 million in reduced dredging and confined disposal facility costs.

As part of the pilot project NRCS prepared a detailed analysis of the effect of Conservation Buffers on sediment reduction in the harbor. The analysis concluded that widespread implementation of the conservation buffer practices within the watershed could provide 29,000 cubic yards of sediment reduction to help meet project goals. Conservation buffers are new tools which should be incorporated into future project plans to increase project effectiveness.

The project report concludes that two years in not enough time to effect the long term changes needed to see actual results in the harbor. It proposes full implementation of the long term Soil Conservation Program plan as contained in the Phase III report. The report recommends a six year project funded at the levels originally proposed as part of the Phase III report, with additional funding to accelerate the Conservation Buffer Initiative within the watershed. The report also proposes a Trust Fund for the Harbor to maintain project accomplishments long term.

INTRODUCTION

The Toledo Harbor Sediment Reduction Project is a pilot project by the Natural Resources Conservation Service to demonstrate how upland erosion control can reduce sediment delivery and dredging needs in the Toledo Harbor. This report will summarize the project activities and accomplishments including:

- Goals
- Project Activities
- Project Accomplishments
- Conclusions and Future Recommendations

The Port of Toledo is one of the Great Lakes busiest, with annual shipping values reaching into the tens of millions of dollars. The Port also represents the most severe dredging problem on the Great Lakes, accounting, on the average, for one-fourth of all the dredging dollars expended each year to maintain Great Lakes harbors. The U. S. Army Corps of Engineers spends, on the average, \$2.2 million dollars each year to remove an average of 850,000 cubic yards of sediment to maintain the ship channel to twenty-six feet of navigable depth (Sohngen et. al, 1998). When the additional long term costs of constructing and maintaining confined disposal facilities to accept the dredged material are included, average annual dredging costs approach \$4-5 million per year.

In addition to the economic costs associated with dredging, there are numerous environmental costs and issues. Foremost of these are the two issues of open lake disposal and the construction of new confined disposal facilities.

Currently, part of the dredged material is disposed of by dumping in the open lake. There are various viewpoints by both resource management agencies and the general public as to the environmental acceptability of this practice. State and/or Federal Environmental Protection Agencies must issue permits under the water quality regulations to allow open lake disposal of the dredged material. These agencies have indicated that future permits may be at risk unless satisfactory progress is made towards alternatives which will reduce the frequency of dredging and/or open lake disposal.

The dredged material which is not disposed of in the open lake is placed in confined disposal facilities. These facilities are filling up and eventually there will be a need to find additional space for that material which must be disposed of in a confined disposal facility. Siting and construction of new confined disposal facilities is difficult because of the lack of available space on land, the environmental concerns of placing new facilities in the lake, and the costs involved.



Picture 1 Agricultural landowners view dredge in operation in Toledo Harbor.

TOLEDO HARBOR PROJECT BACKGROUND

Long-Term Management Study (LTMS)

For the previously mentioned reasons, and to insure the long term economic viability of the Toledo Harbor, Congress instructed the U. S. Army Corps of Engineers to work with Federal, State and Local Resource Management Agencies to carry out a team approach to solve the dredging problem in Toledo Harbor. In April of 1992, the Assistant Secretary of the Army for Civil Works directed the Corps of Engineers to form a group to develop a Long Term Management Strategy (LTMS) for the Toledo Harbor. The group consisted of representatives from:

United States Environmental Protection Agency
City of Toledo
Natural Resources Conservation Service
Maumee RAP
Ohio Environmental Protection Agency
Toledo Port Authority
U. S. Fish and Wildlife Service
Corps of Engineers
Ohio Department of Natural Resources
Ohio Lake Erie Office

The group organized into an Executive Committee, which consisted of leaders of the above named agencies, and a study team which consisted of the agencies corresponding technical specialists. These groups met over a period of several years to develop the Long-Term Management Strategy for the harbor. As the study team carried out its deliberations, it became apparent that due to the magnitude of the problem, no one element or agency could solve the dredging problem on its own. The strategy, which was eventually adopted and outlined in the phase III report, contained several key elements including:

Soil Conservation Technologies to apply upland erosion control and stop the sediment at its source.

- Confined Disposal Facility (CDF) Management to extend the useful life of the existing Confined Disposal Facility.
- Recycling and reuse of the dredged material for beneficial uses.
- Studies to use the dredged material to nourish wetlands.
- Studies to increase the capacity of the CDF.

Agricultural Goal

Each of the elements selected would make a significant contribution to reducing the dredging problem. Therefore, goals were assigned to each of the components in the Long-Term Management Plan. The goal assigned to agriculture was to reduce sediment originating from agricultural sources by an amount that would reduce dredging by 130,000 cubic yards (or 15%) each year. The 15% annual reduction in dredging is compared to the amount dredged in the 1992 reference condition.

NRCS AGRICULTURAL SEDIMENT REDUCTION PROJECT

Toledo Harbor Sediment Reduction Overview

Sediment in the Toledo Harbor originates as erosion from the farm fields within the Maumee River Basin. The Maumee River drains more than 4.2 million acres in Ohio, Indiana, and Michigan. More than 75% of the acreage is cultivated cropland, the bulk of which is corn and soybeans. Even though the average per acre erosion rates in the watershed are low by national standards, the sediment load in the Maumee is extremely high by national standards due to the large watershed and the high percentage of the watershed that is intensively cultivated cropland.



Picture 2 Erosion on Flat Crop Fields in the Maumee River Watershed

The Waterville Gauge on the Maumee River at Waterville, Ohio, has measured an average annual suspended sediment load of 1, 300,000 tons. According to the 1993 NRCS Report "Erosion and Sedimentation Dynamics of the Maumee River Basin" approximately 33% of the sediment that passes the Waterville gauge is deposited in Toledo Harbor. This amount converts to cubic yards of dredging as follows:

This amount generally agrees with the average amounts reported dredged each year. In February 1989, the Corps of Engineers, in the "Environmental Assessment and Finding of No Significant Impact- Operations and Maintenance for Toledo Harbor, Lucas County, Ohio," reported that 780,000 cubic yards of sediment are dredged from the ship channel annually. More recently the Corps has reported that dredge amounts average 850,000 cubic yards annually (Sohngen et. al.).

The Toledo Ship Channel consists of two components: a river channel and a lake channel. Of the 850,000 yards dredged annually, approximately 47 percent or 400,000 yards is dredged from the river channel with the remainder being dredged from the lake channel (Sohngen et. al.).

Much remains to be learned about the sediment dynamics of the harbor. It is commonly accepted that the need to dredge can never be fully eliminated. However, source reduction is expected to have significant beneficial effects in reducing dredging amounts, cost and/or dredging frequencies. The following information supports this premise:

- * The amount of sediment (in tons) which passes the Waterville gauge annually is roughly equivalent to the amount dredged in cubic yards. If the incoming sediment is reduced, over time either dredging will be reduced or the harbor will get deeper.
- * The river miles sediment represents almost half the annual dredging. The source of the river miles is more logically-would be incoming river sediment rather than lake effect storm generated sediment.
- * The river miles section of the ship channel is the most costly sediment to dredge.
- * The sediment in the river miles section is the <u>most contaminated</u> and <u>must be confined</u>. Reducing dredging of the river miles section will reduce environmental disturbances and extend the life of the CDF facilities, thereby reducing dredging costs.

Soil Conservation Goals

The LTMS Study Team assigned a goal of reducing dredging attributed to agricultural sources by 130,000 cubic yards annually as compared to the 1992 baseline condition. This represents a 15% reduction in dredging. (Long-Term Management Study, Phase III Report, U.S. Army COE).

The goals of the NRCS Soil Conservation Plan in the Phase III Report were as follows:

- 1. Utilize a field delivery structure that was capable of creating public awareness of the dredging problem and accelerating sediment reduction activities by landowners in the watershed.
- 2. Increase the acreage of corn and soybeans grown under conservation tillage in the watershed to 75% of the watershed.
- 3. Increasing the acreage of filter strips and sod waterways in the watershed.
- 4. Develop pilot projects which use constructed or restored wetlands as sediment traps.
- 5. Quantify the beneficial changes in the watershed over time including changes in conservation tillage and gross erosion changes for the watershed.

The original Soil Conservation Plan relied almost entirely on conservation tillage (item 2) as the primary means to achieve the sediment reduction goal. At the time the proposal was prepared it was felt that filter strips would not be effective in achieving the goal because of the lack of a program with economic incentives that would convince farmers to install filter strips in them in numbers sufficient enough to make a difference.

Funding

As part of the Phase III report NRCS prepared a proposal to implement a sediment reduction program in the watershed over a 6 year time period (Erosion and Sediment Dynamics of Toledo Harbor, NRCS, 1993). The full cost for the 6 year proposal at that time included \$1.5 million for technical assistance (personnel) and \$8 million for financial assistance (incentive payments) to landowners and county sediment reduction committees. The proposal also included a need for an additional \$7 million to capitalize a long term maintenance fund for the project for a total project cost of \$16.5 million.

The study team proposed redirecting of dredging funds as an innovative idea for funding the Soil Conservation Plan. The rational of the team was that:

- * Dredging funds represent a user fee on the shipping industry which would benefit from reducing the dredging and keeping the harbor open.
- * Utilizing dredging funds to prevent sediment pollution and reducing dredging would be more environmentally sound than removing sediment from the harbor after it got there.
- * It would be more cost effective to keep sediment out of the harbor than to dredge it after it got there.
- * Solving the sediment problem in the harbor will require reducing erosion levels within the watershed below the target levels of traditionally funded agricultural soil conservation programs.

NRCS PILOT DEMONSTRATION PROJECT

In August of 1995, the Natural Resource Conservation Service and the U.S. Army Corps of Engineers, meeting on the banks of the Maumee River, signed an agreement for NRCS to carry out a pilot demonstration project. This was a historic event in that it was the first time that dredging funds were redirected to upland soil conservation measures to reduce the dredging problem.

The U. S. Army Corps of Engineers funded a pilot demonstration project in the amount of \$750,000. Of the \$750,000, the Corps kept \$50,000 for monitoring and evaluation, and \$700,00 was allocated to NRCS to carry out the demonstration project. The project was for a two year time frame, from October 1995 to October 1997 and represented the 1996 and 1997 cropping seasons. The project became known as the Toledo Harbor Sediment Reduction Demonstration Project, or Toledo Harbor Project for short.

Methods Used For The Project

The method used to carry out the project was modeled after the previously highly successful Lake Erie Phosphorous Reduction Project. Key elements of this model included:

- A voluntary effort
- A locally led process
- Establishment of county goals
- Use of partnerships
- NRCS leadership and coordination
- Grants to local sediment committees to carry out sediment reduction activities

NRCS established a project coordinator position who provided overall leadership for the project. Each county in the basin was asked to form a sediment reduction committee and develop a county sediment reduction strategy. The counties were expected to use the locally led process and involve other conservation partners in developing the strategy. The counties were then invited to compete for grant funds to implement the various action items in their county strategies.

County Sediment Committees and Locally Led Strategies

Twenty-two of the twenty-five counties developed county strategies. The three counties that did not participate had very small fringes of acreage on the edge of the watershed. The average sediment reduction committee consisted of 16 individuals in size. Over 44 different organizations participated as partners on the collective committees.

NRCS utilized project funds for two purposes. The majority of the funds (76%) were allocated to counties for sediment reduction activities (chart 1). Twenty-four percent of the project funds were used to fund the project coordinator position to lead the project.

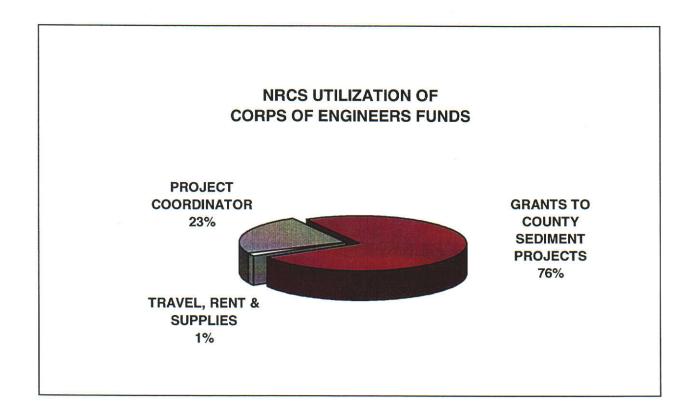


Chart 1 NRCS Utilization of Corps of Engineers Funds.

Grants To Sediment Committees

Each county was awarded \$2000 upon completion of its county sediment reduction strategy. This money was intended to cover the expenses associated with development of the strategies including hosting meetings, postage, printing, etc. The remaining funds were then offered to counties in competitive grants. Two grant cycles were held and some supplemental funding was awarded at the end of the project to balance out remaining needs and assure effective utilization of all grant funds. The distribution of the county funding was as follows:

Tot	al	\$525,356
Supplemental Funding		<u>\$ 12,756</u>
Grant Cycle Two		\$312,400
Grant Cycle One		\$156,200
County Strategies		\$ 44,000

Grants were awarded based on merit, innovation, potential for success, and likelihood of contributing to sediment reduction. A project advisory committee was established to review the grants and recommend the grant awards. The advisory committee consisted of:

TOLEDO HARB	OR PROJECT A	DVISORY COMMITTEE
Member	State	Affiliation
Ivan Myers Ed Crawford Richard Kohls Steve Moore Jerry Storer Wayne Peterson	Ohio Ohio Ohio Indiana Indiana Michigan	SWCD Supervisor and farmer ODNRProgram Specialist SWCD Supervisor and farmer Farmer Farmer SWCD Staff
Dave Sanders Dave Lamm Tom Van Wagner Gerry Landon	Ohio Indiana Michigan Ohio	NRCS District Conservationist NRCS District Conservationist NRCS District Conservationist Formerly, Director Maumee Conservancy District

Table 1 Toledo Harbor Project Advisory Board Members

COUNTY SEDIMENT REDUCTION ACTIVITIES

One of the premises of locally led conservation is that local people know best the solutions to local problems. The activities carried out to implement the county strategies were an example of locally led conservation in action. The sediment committees generated many unique and innovative project ideas that were funded by the project advisory committee. These ideas represented activities that the local people felt would be effective in reducing erosion and sediment export from their county. The collective county sediment reduction strategies included 3 major components. These were:

- Incentive Programs for Landowners
- Demonstration Projects
- Information and Education Activities

Incentive Programs for Landowners

The largest activity within the county strategies consisted of many varied incentive programs to encourage individual landowners to apply sediment reducing conservation practices on the land. These different incentives included:

- Vegetative Cover Programs
- Structural Practice Programs
- Conservation Tillage Farmer Incentives
- New and Innovative Ideas

Vegetative Cover Programs

Vegetative cover incentives were offered by 11 counties. These incentives encouraged landowners to install conservation buffers (filter strips), convert cropland to grassland, utilize fall seeded cover crops, etc. The sediment reduction benefit from these activities included filtration of runoff and also reduced erosion rates by changing intensive row crop cultivation to grass cover.

Specific types of incentives offered included:

CRP Filter Strip Bonus Programs
Non-CRP Filter Strip Contracts
Cover Crop Incentives

Funding to Apply Complete RMS Systems Land Use Conversions of Cropland to Hay

Incentives to Establish Tree Corridors (Riparian Forest Buffers)



Picture 3 Grass filter strips trap sediment and filter runoff water.

Conservation Tillage - Farmer Incentive Programs

Conservation Tillage Incentives were offered by every participating county. The incentives fell into two major categories, equipment incentives to individual farmers who agreed to practice conservation tillage and tillage demonstrations which educated farmers as to new techniques or more successful methods of utilizing conservation tillage. In both cases the goal of the incentive was to increase the rate of conservation tillage use in the watershed, which would result in less gross erosion within the watershed and less sediment delivery to the harbor.

The Farmer Incentive Programs generally assisted an individual farmer to buy, lease or rent a piece of conservation tillage equipment or equipment attachment that would enable him or her to do new conservation tillage or get more consistent results with an existing conservation tillage system. These incentives included:

Purchase of Strip Tillage Tools
Contracts to Leave High Amounts of Crop Residue
Development of Equipment Coops
Support to Design and Build Row Dryers
Retrofits of Narrow Chisel Points
No-till Planter and Drill Rebates

All of these programs served to promote increased acres of conservation tillage by giving farmers the capacity to carry out the practice of conservation tillage on more acres with better success.



Picture 4 No-till farming protects soil from erosion with residue cover.

Structural Practice Incentives

Three counties included incentives to apply structural conservation practices including erosion control structures, sod-waterways, and water and sediment control basins. In general these incentives were used in situations where these practices were needed and other conservation programs were unavailable. These represented a small amount of the total county activities. In most cases counties utilized other conservation programs to meet this conservation need.

Innovative Ideas Developed

There were some very innovative conservation tillage incentive ideas developed as part of the sediment reduction project. Some of these were as follows:

Equipment Cooperatives

One county conceived a very innovative program to use equipment cooperatives to enable groups of farmers to collectively purchase, own and jointly use a no-till drill. None of the farmers could afford to own one on their own due to the size of their operation, but together they could purchase and own the equipment necessary to do no-tillage farming. The farmers received financial assistance from the sediment committee and legal assistance from the cooperative extension service to set up the equipment coops.

Strip Tillage Programs

Strip tillage is a new practice that is a hybrid between notillage and conventional farming. A very narrow strip of soil (3-6" inches) is worked in the fall in preparation for spring planting. The remaining residue between the row is undisturbed. This system shows potential to overcome some of the problems associated with no-till in heavy residues (i.e., wheat stubble) on heavy wet soils. Many counties developed programs to promote this practice.

Designing of Row Dryers

One of the challenges of a total no-till system has been to no-till corn into soybean or wheat stubble on some soils. To overcome this obstacle, some counties conceived and built "row dryers" which are units with brushes that sweep the residue away from a narrow strip where the crops are then planted. These units are light weight and do not take a lot of horsepower, so they can cover a lot of acres in a day. They are used a day or two ahead of planting to warm up and dry out the soil. This results in better germination and more even stands which make the no-till practice more successful. The intent is that farmers will see the benefits of this practice as an alternative to returning to conventional tillage.

Outreach to Small Farmers

In the Michigan reaches of the watershed there were areas with small farmers who did not have the horsepower to pull the commonly available no-till drills, which are 15 feet in width and weigh several thousand pounds. Some committees utilized funds to purchase some smaller 10 foot drills which were made available to small farmers to use. This then enabled the small farmers to utilize the no-till practice.

Demonstration Projects Developed

Demonstration programs are designed to increase awareness among farmers of a particular practice and the benefits of using it. This can be done by showing a new technique, establishing plots designed to collect important data or serve as a show place for tours and field days, or by providing an opportunity for hands on learning. Demonstration projects are particularly important in that they offer an opportunity for neighbor to neighbor sharing of information, experiences and conservation values. Demonstration projects using farmers and/or agribusiness are also important because studies have shown that farmers value other farmers as a primary source of information, often times ahead of agency personnel. The county sediment strategies included demonstration activities in two significant items, namely conservation tillage demonstrations and demonstrations of wetlands as sediment traps.

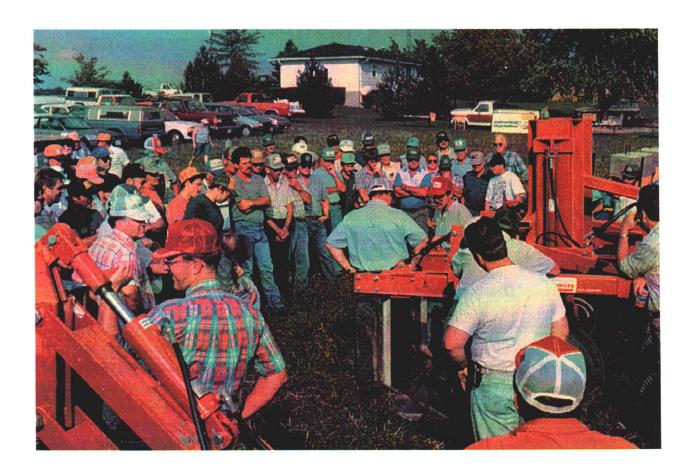
Conservation Tillage Demonstration Programs

Each spring, the more than 25,000 individual farmers in the basin make a conscious decision whether to till or not to till the more than 200,000 different crop fields in the basin. Residue cover, or lack thereof, is the single most important factor which most influences delivery of sediment to the harbor. The collective results of these 200,000 individual voluntary decisions influences the amount of sediment delivered to the harbor more than any thing else. If sediment reduction is to be achieved using voluntary means, then farmers have to be educated in the benefits to them of using conservation tillage, including the different alternative systems, the techniques for success, and ways to overcome challenges associated with the profitability of this method of farming. On farm conservation tillage demonstration programs have been found to be a very effective way of doing this.

Thirteen counties utilized project funds to carry out conservation tillage demonstrations. These activities were designed to raise the knowledge level among farmers as to how to successfully use conservation tillage. The field days also served as forums to explain the harbor sedimentation problem and link the need for conservation tillage to the long term health of the harbor. Over 2,200 people attended the 17 field days that were held during the two year project.

Demonstration activities offered by the 13 counties included the following:

- Establishment of Long Term No-till Demonstration Plots
- Strip and/or Zone Till Demo Programs
- No-till Management Surveys
- Long Term Demonstrations of No-till in Soybean and Wheat Stubble



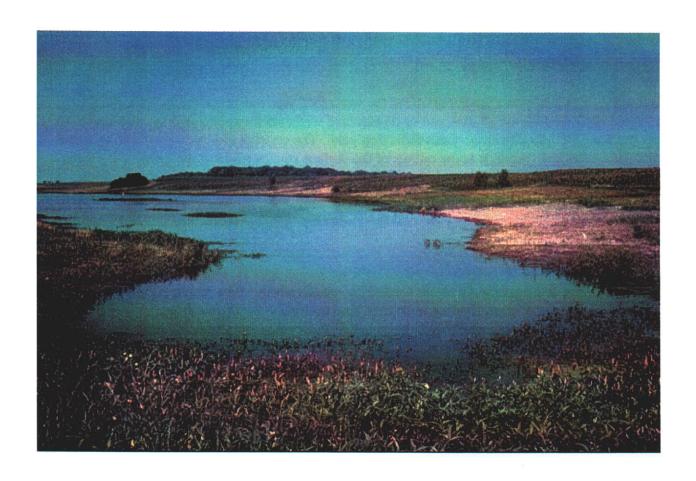
Picture 5 Conservation tillage field day

Wetlands As Sediment Traps

The NRCS Soil Conservation Program for the watershed that was proposed in the LTMS included the potential use of restored or constructed wetlands for sediment traps as a means to help achieve the 130,000 cubic yards reduction goal. The concept involves constructing small (1-4 acres) shallow wetlands at the outlets of the surface swales which drain small watersheds (20 - 80 acres). The wetlands would be shallow (1-3 feet) and would serve as conservation buffers to increase detention times of surface runoff. The goal of this practice would be for sediment carried in the runoff to settle out in the wetlands rather than in the main channels and the harbor.

Although this concept is technically sound, little watershed specific data exists to quantify the effectiveness of this practice, or to use for design specifications. As a result, NRCS allocated \$25,000 of the county grant funding to support data collection for this activity. NRCS entered into an agreement with the Maumee Valley Resource Conservation and Development Organization (RC&D), and its partners, to support data collection under the Marketing Wetlands for Profit project.

The Marketing Wetlands for Profit project is a collaborative effort of the RC&D, The Ohio State University, Michigan State University, and the USDA Agricultural Research Service. It is a project which involves filtering surface and tile drainage runoff through wetlands, collecting it in storage ponds, and recycling the water for use as subsurface irrigation water. Such a closed system has the potential to keep most of the sediment and nutrients for leaving the crop field.



Picture 6 Wetland Sediment Trap.

Wetlands have been constructed at three project sites in conjunction with the Van Wert, Fulton, and Defiance Soil and Water Conservation Districts. NRCS has entered into a contract with the RC&D executive council to support a three year program to collect runoff data and to tabulate sedimentation and water quality impacts of the wetland components of these three systems (Appendix 2). This project will provide some of the information that is needed to help evaluate a comprehensive program to use wetlands for sediment reduction throughout the Maumee Watershed. The contract calls for data collection to be carried out over the next 3 years.

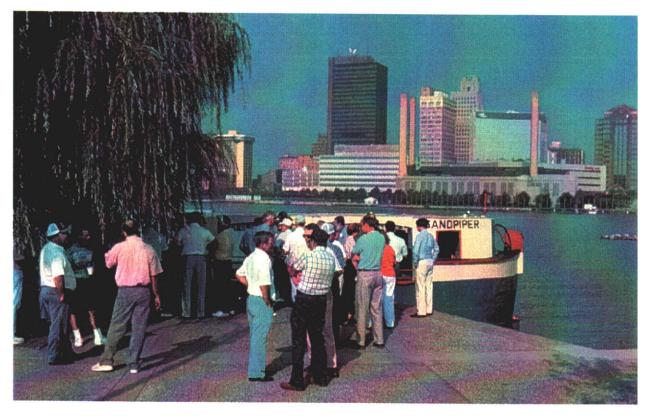
Information and Education Activities

Every county strategy included an information and education component. The information and education activities served to raise the awareness level of the dredging problem and solutions which would result in sediment reduction. The information activities were intended to give identity to the county sediment committees and the locally led sediment reduction process.

The county information strategies utilized a wide variety of methods to disseminate the sediment reduction message. Activities carried out included:

Newsletters
Tours
Radio Programs
TV Programs
Field Days
Watershed Meetings
Training Sessions

One of the information activities organized by the NRCS Project Coordinator included a tour of Toledo Harbor for sediment committee members. The tour included presentations on dredging and the dredging issue, a tour of the confined disposal facilities, and a tour of the tour shipyard terminals and dry docks. Three bus loads of sediment committee members got the opportunity to see firsthand the sediment problem and its effect on the shipping industry.



Picture 7 Sediment Committees Tour Toledo Harbor.

ACCOMPLISHMENTS OF SEDIMENT REDUCTION COMMITTEES

The Local Sediment Reduction Committees proved to be a successful delivery system to implement sediment reduction activities. Three areas in which the committees excelled included:

- Developing partnerships.
- Leveraging and attracting funds.
- Effectively distributing funds amongst numerous sediment reduction activities.

Partnerships Developed

Over 44 different organizations participated as partners one or more of the sediment reduction committees. The 44 organizations represented 9 different types of organizations (Table 3).

TOLEDO HARBOR PARTNERSHIPS	
Watershed Groups	5
Agr Business Organizations	10
Universities	4
Private Environmental Groups	7
Public Environmental Groups	2
Federal Govt. Agencies	4
State Govt. Agencies	4
Local Govt. Agencies	5
Regional Govt. Partnerships	3
Total	44

Table 2 Types of Toledo Harbor Project Partners.

The organizations represented a wide variety of public and private partnerships. The presence of these organizations at the planning meetings multiplied and amplified the efforts of NRCS and the local Soil and Water Conservation Districts to tackle the harbor problem. Their presence also brought additional ideas, expertise, knowledge and program resources to the sediment reduction effort. Table 4 lists all of the conservation partners that participated in one of more of the local sediment committee efforts.

Toledo Harbor Partners

Ottawa River Coalition Michigan State University **TMACOG** USDA Agr. Research Service Ohio State University OSU Extension Conservation Technology Information Center Monsanto Chemical Co. Defiance Agr. Research Assn. The Andersons Ohio No-Till Farmer Assn. City of Adrian **Ducks Unlimited** Maumee Remedial Action Plan Whitehause Grain Glandorf Warehouse Fish Creek Watershed Initiative Natural Resources Conservation Service

Median Twp. Trustees Michigan Soybean Association The Nature Conservancy Hamilton Lake Advisory Bd. **BASF** Corporation St. Joseph Watershed Initiative Pheasants Forever ODNR- Division of Wildlife Toledo Port Authority Maumee Valley RC&D HeidleBerg College River Raisin Watershed Group ODNR Div. Of Soil and Water IDNR Div. Of Soil and Water Ag Credit Corporation Maumee Watershed Cons. Dist **County Engineers** County Health Boards

Table 3 Organizations participating as partners on county sediment committees.

Leveraging of Funding

In additional to technical know how and expertise, the partners also brought additional funds to the effort. The U.S. Army Corps of Engineers funding represented two-thirds (67 %) of the funds expended on the pilot project, with an additional one-third being leveraged from other

sources. Approximately 26 percent was contributed by NRCS and the Soil and Water Conservation Districts (13% each) in the form of salaries for personnel to administer, publicize and carry out the project activities at the local level over the two year project period. An additional 6 percent (\$69,150) was contributed by other partners in the form of cash grants to the sediment committees. Chart 2 indicates the funds used on the project and the funding sources. These figures do not include any value placed on the time of the other partners, exclusive of NRCS and SWCD's, that participated in the project.

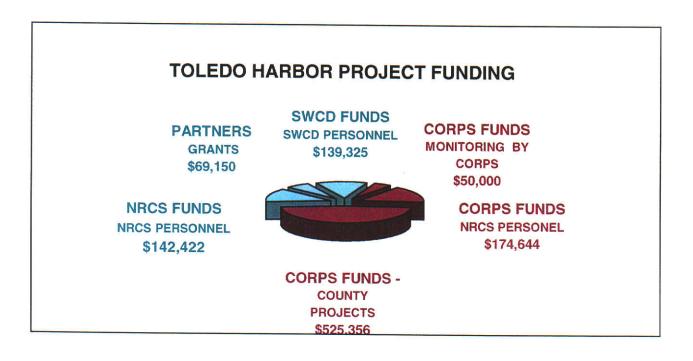


Chart 2 Funds used for the Toledo Harbor Project effort. Red represents \$750,00 of Corps of Engineers funding. Blue represents \$350, 897 in funding that partners contributed from their own budgets for personnel and grants.

Effective Use of Sediment Grant Funds

Local sediment committees used the funds in ways that they thought would be most effective within their counties to reduce erosion and decrease sediment export from their individual counties. The activities varied from place to place, but the composite distribution of funds provided a very acceptable mix of important project activities. Chart 3 shows the overall use of the \$525,356 in grant funds allocated to the collective sediment committees and the distribution amongst the various components.

HOW COUNTY SEDIMENT COMMITTEES UTILIZED TOLEDO HARBOR PROJECT FUNDS

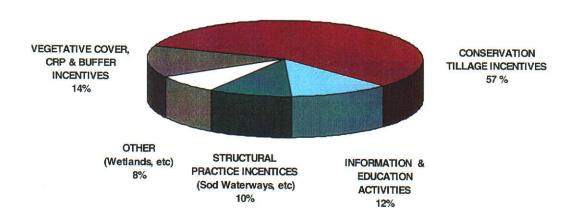


Chart 3 Utilization of Grant Funds by Sediment Committees

Approximately 57 percent of the funds were used for conservation tillage activities which offer the greatest potential for sediment reduction. Approximately 22 percent were spent for conservation buffers, vegetative cover and wetland activities. Twelve percent were used for information and education activities. Only 10 percent were used for structural erosion control practices which have been traditionally supported by other USDA programs.

MEASURES OF PROGRESS FOR PROJECT PERIOD

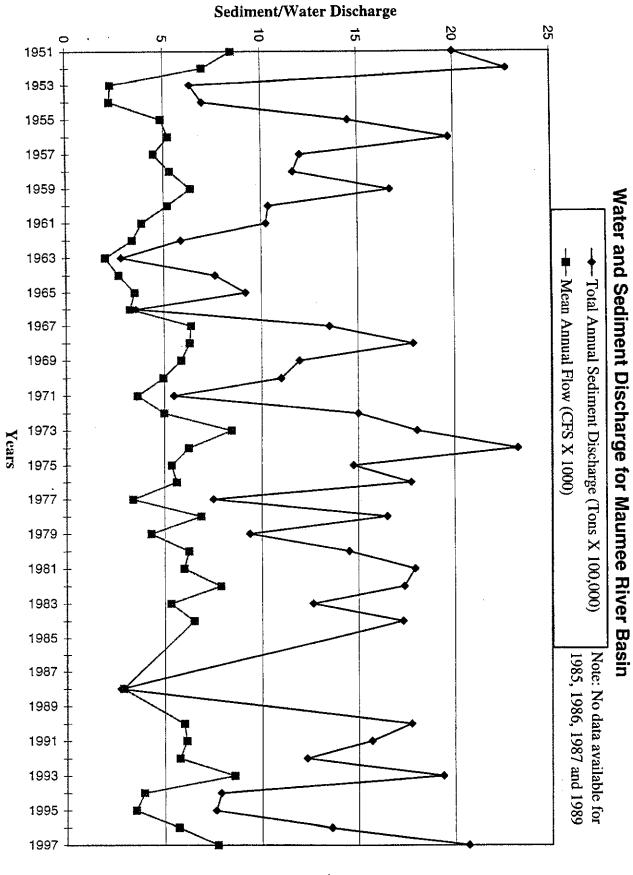
Whereas dredging occurs on an annual basis, the amount of sediment delivered to the harbor in any one year is highly variable and dependent the magnitude of storm events in that given year. Table 5 gives long term records of water and sediment discharge for the Maumee River based on gauge data at the Waterville station. Note the extreme annual variability from year to year based on the severity of storm events and mean annual flow.

The demonstration project period 1995-1997 contained some of the both the highest and lowest sediment discharge amounts on record. For this reason a change in land cover on the landscape may not be immediately evident in the corresponding gauge data at Waterville, or in short term dredge quantities.

Much remains to be learned about sediment transport in the basin. What is known, however, is that the sediment originates as cropland erosion from the uplands, and that stopping the sediment at its source will in time result in less sediment that can be delivered to the basin's streams and rivers and ultimately to the harbor.

Since the pilot project period was too short to actually measure long term effects in the harbor, other means were employed to measure progress. Three measures were employed to evaluate the effect of project activities on sediment reduction in the harbor. These include:

- 1. Measurements of Conservation Tillage Trends Within the Maumee Basin.
- Measurements of Long Term Sediment Monitoring by Heidleberg College and Case Western Reserve University (Lake Erie Agricultural Systems for Environmental Quality Study).
- 3. Estimates of Gross Erosion within the Watershed



Measurements of Conservation Tillage Trends

Conservation-tillage is one of the single most important factors in influencing the rate of erosion on Corn and Soybean fields. Collectively, these fields represent the largest land use in the watershed. Erosion calculations substantiate that these corn and soybean fields contribute the largest single source of sediment to the harbor.

Conservation tillage is the single most important practice in preventing the soil erosion that is the source of this agricultural sediment. The extent to which this practice is applied to the land influences the rate of sediment delivery to the harbor more than any other human influence in the watershed.

Conservation tillage acres are measured each year by the NRCS using county transects which collect data at sample points over predetermined routes. This data is extrapolated into a statistically accurate measure of the acres in each county by crops grown and tillage types. Since the same procedure is used each year the data can give accurate trends over time.

As part of this report for the NRCS pilot project, the tillage transect data for the Ohio Counties in the watershed was analyzed for the following purposes:

- To quantify watershed trends by tillage type for the project period.
- To compare the compare the rate of conservation tillage adoption in the Toledo Harbor Project Counties to Non Toledo Harbor Project counties.
- To compare the rate of conservation tillage adoption in other conservation tillage enhancement projects to similar non-project counties.

Conservation Tillage Trends in the Toledo Harbor Counties

The Toledo Harbor Demonstration Project covered the crop years 1996 and 1997. Chart 4 shows the conservation tillage trend for corn and soybean acres in the Ohio counties in the project, up to and including the two year project time period. The same graph shows the trend for all Ohio counties for the same time period. The trendline indicates the conservation tillage acres within the project increasing during the project period. The same date shows that while the acres within the Toledo Harbor Project counties continued to increase, the acres in the state as a whole peaked in 1994 and have held flat or declined since then. The data also shows that at the end of the project period the Toledo Harbor counties had a 9% greater rate of conservation tillage adoption than the state as a whole.

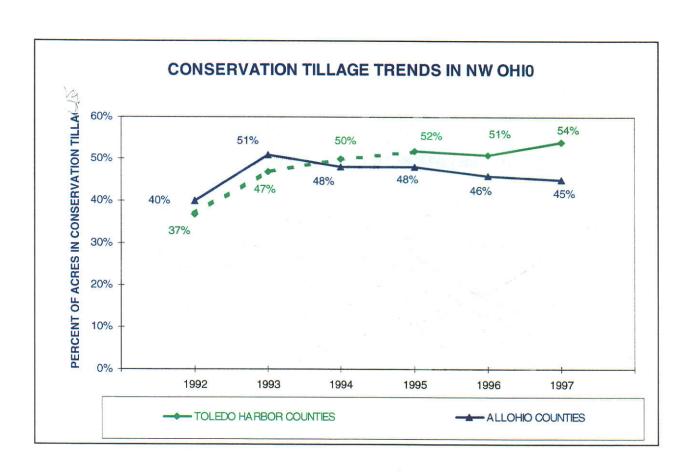


Chart 4 Conservation tillage trends in Toledo Harbor counties (Ohio).

Conservation Tillage Trends of Other Projects

Some Counties in the Maumee Watershed have been the recipient of other tillage demonstration project funds in previous years. The question often asked is "Are these projects effective?" In order to further test the theory that these projects have a positive impact, additional comparisons were made using the rates of conservation tillage adoption in project and non-project counties. The two programs tested were the Section 319 Equipment Buydown Program and the Conservation Action Project (CAP).

The section 319 program provided U.S. EPA funds in the early 90's to some counties in the Maumee watershed which were passed on to farmers to lower the cost of procuring conservation tillage equipment (Equipment Buydown Program). Not all counties in the watershed received funds before the project funding ran out. Chart 5 shows the growth of conservation tillage adoption in the 319 funded counties as compared to the similar non-funded counties in the Maumee and Sandusky watersheds. The data again shows that the trend of conservation tillage in the targeted counties was continuing to rise, whereas the non targeted counties leveled off in 1993 and have held flat or slowly declined since then. At the end of the 1997 crop season the targeted counties had a 9% greater rate of conservation tillage adoption.

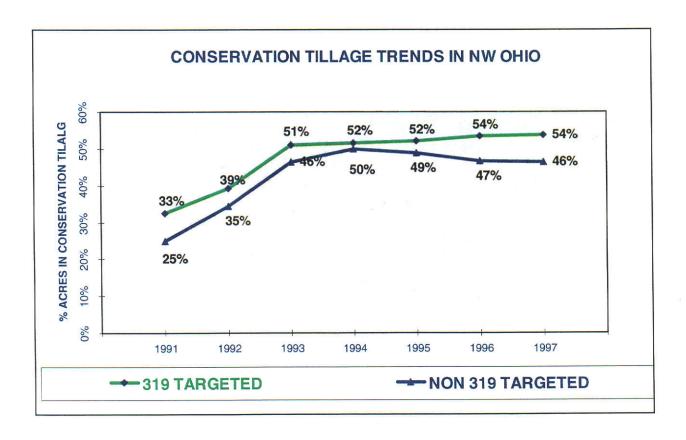


Chart 5 Conservation tillage trends in 319 targeted counties versus non targeted counties.

The Conservation Action Project (CAP) is a long term conservation tillage promotion program that is a public-private partnership in 6 counties at the mouth of the Maumee River Watershed. The rate of conservation tillage adoption in this project area was compared to the rate of adoption in the non CAP counties in the Maumee and Sandusky watersheds (Chart 6).

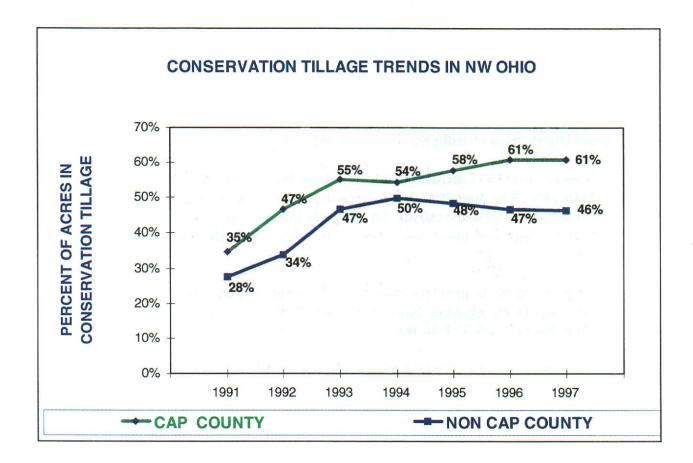


Chart 6 Conservation tillage trends in CAP versus non-CAP Counties

Chart 6 shows a similar trend as the previous two comparisons. The rate of conservation tillage adoption has continued to climb in the CAP counties when compared to the non CAP counties in the watershed. At the end of 1997 the CAP counties had a 63 percent conservation tillage adoption, compared to 46 percent for non CAP counties!

The rate of adoption for the CAP counties is the highest for any of the groups in any comparison. Two reasons are given for this. One, the soils are more conducive to conservation tillage. But secondly, and more important, the CAP counties as a group have received the most incentives of any of the counties, being in the CAP, Section 319, and the Toledo Harbor Project areas.

Clearly the data shows that where conservation tillage incentives are offered, farmers will accelerate the rates at which they adopt and stick with the erosion control practice!

LEASEQ -

Lake Erie Agricultural Systems For Environmental Quality

The Lake Erie Agricultural Systems for Environmental Quality Study (Appendix 3) is a retrospective evaluation of the changes in land management and water quality of the Maumee and Sandusky River Basins for the period 1991 to 1995. This study was carried out by Heidleberg College, Case Western Reserve University, and The Ohio State University. It is based on data from 20 years of monitoring, beginning in 1975, which has produced daily and more frequent observations of sediment concentrations in the Maumee and Sandusky Rivers.

The study of these two rivers concludes that for this time frame "Sediment concentrations are down by about 20%. The magnitude of these changes and their timing relative to changes in tillage and fertilizer use demonstrate that they are largely due to improved agricultural stewardship of the land and water resources of the Lake Erie Basin" (Baker, Calhoun, and Matisoff, 1998).

This recently released study provides clear and irrefutable evidence that increasing conservation tillage in the Maumee River Basin will decrease sediment concentrations in the river and delivery to the Toledo Harbor!

It is important to note that while the LEASEQ Study looked at a twenty year data, the bulk of the conservation tillage practice increases came about in the last 5 years of the study. If in fact there is a lag time between when erosion control is applied to the land and when the changes show up in stream flows at the mouth, additional benefits may be yet to be measured.

Watershed Gross Erosion Estimates

The third measure of project success is the yearly changes in gross erosion in the watershed. Gross erosion is influenced by the following factors:

- Acres of Conservation Tillage Practiced
- Yearly Mix of Row Crops, Small Grains & Meadow Crops Grown
- Acres Enrolled in the Conservation Reserve Programs
- Acres of Conservation Buffers added to the Watershed

As reported above, acres of conservation tillage increased within the watershed during the project period. Acres enrolled in the conservation reserve have held reasonably steady. Acres of conservation buffers increased during the project period. All of these factors are serving in a positive fashion to reduce gross erosion and bring about sediment reduction.

In addition, the mix of crop acres in the basin has very recently began to change. Changing commodity programs and lower market prices are resulting in a shift to more corn and soybean crops, at the expense of wheat, oats, hay and traditional setaside acres. This shift has the potential to increase erosion and sediment production if these new row crop acres are farmed using conventional farming methods. It will not have a significant impact if conservation tillage is used on these acres. Thus, the shifting crop acres is increasing the importance of widespread adoption of conservation tillage in achieving sediment reduction goals.

At the same time commodity market prices are dropping. Low market prices may entice more farmers to enroll in the Conservation Reserve Program (CRP) and/or install Conservation Buffer Practices under the continuous Signup Provisions of the CRP. These actions will have a positive effect on sediment reduction.

It is impossible to predict in advance the land cover decisions which farmers will make in any future year. However, annual land cover data is collected and can be analyzed and converted to yearly gross erosion estimates to quantify annual trends. NRCS is in the process of analyzing the most recent data to develop updated gross erosion estimates for the watershed for the project period 1996-1997 and also for the 1998 crop year. This data will be provided in the near future as an addendum to this report.

A preliminary estimate, extrapolated based solely on the increased conservation tillage and conservation buffer data from the Ohio Counties in the watershed, would suggest that at the end of the project in 1997, progress towards sediment reduction had been 53 percent towards the annual goal of 130,000 cubic yards of sediment reduction.

Chart 7 shows the progress that has been made towards the annual goal of 130,000 cubic yards of reduction during the two years of the project. This data is based on the trends in conservation tillage and buffers in the Ohio portion of the watershed. Data from Indiana and Michigan is expected to be similar.

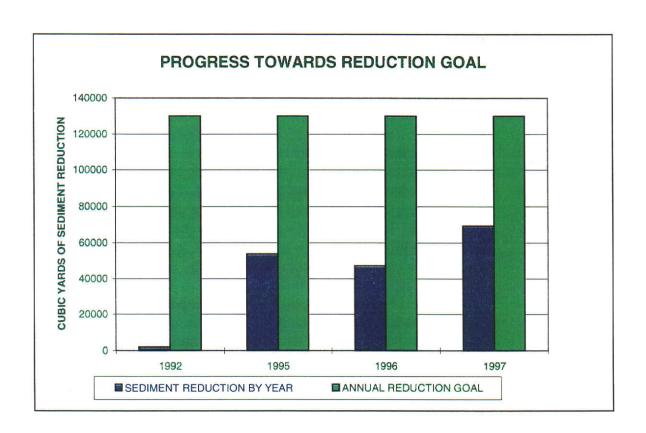


Chart 7 Progress towards sediment reduction goal

Cost Effectiveness of the NRCS Soil Conservation Project

During deliberations for the Phase III report, one of the questions often raised concerned the cost effectiveness of the Soil Conservation Program. Economists at The Ohio State University recently completed a case study (Soil Erosion in the Maumee River Basin: A Case Study Using Market Methods to Value Environmental Externalities, Draft Report, Sohngren and Rausch, June, 1998) which estimated the benefits of reduced dredging costs in Toledo Harbor if the goal of reducing dredging by 15% is reached.

In the case study the authors used standard market techniques to measure the benefits of reduced dredging costs which would arise from soil erosion reductions. The authors concluded that a 15% reduction in dredging would provide present value benefits to the US Army Corps of Engineers of \$1.3 million dollars per year.

In the above referenced study the authors concentrated solely on benefits due to reduced dredging costs and increased life of the Confined Disposal Facility. No data was included to measure benefits from improved water quality, improved fish and wildlife habitat, the environmental benefits of not disturbing contaminated sediments, etc. The addition of these benefits would increase the value of the Soil Conservation Program.

Chapter 8

NEW OPPORTUNITES FOR SEDIMENT REDUCTION

Conservation Buffer Initiative

The original NRCS Soil Conservation Plan relied almost solely on conservation tillage to achieve sediment reduction. Filter strips were not thought to be a viable component of the plan. At the time the original plan was prepared, there were no good tools available to persuade farmers to agree to widespread installation of grass filter strips in the watershed. Additionally, those filter strips that were installed were sometimes too narrow to bring about significant sediment trapping. This situation has now changed.

In 1997 the Natural Resources Conservation Service, and other Conservation Partners, unveiled the National Conservation Buffer Initiative. The Conservation Buffer Initiative is a 5 year plan with a goal of installing 2 million miles of conservation buffers by the year 2002. Conservation Buffers are soil conservation practices that filter and trap sediment, pesticides, nutrients and other pollutants and contaminants. The buffers include such conservation practices as grass filter strips, wetland restorations, wetland sediment traps, riparian forest buffers, grass waterways, and field windbreaks.

The conservation buffer practices can now be enrolled in the Conservation Reserve Program (CRP) under the Continuous Signup Provisions. Farmers receive an annual rental payment in return for enrolling these practices in the program. Enrollment is via a 10 to 15 year contract which ensures long-term participation and long-term benefits.

Conservation Buffer Analysis for the Maumee Watershed

Extensive installation of properly designed conservation buffers could have a far reaching effect on sediment reduction in the watershed. However, no watershed specific data exists to quantify the numerical extent of these benefits. As part of this pilot project, NRCS prepared an analysis of the effect of buffer installation on dredging amounts (Analysis Of Conservation Buffer Effectiveness For The Toledo Harbor Project, NRCS, Davis et. al., 1998). The objectives of the analysis were to:

1. Quantify the effect of conservation buffers on sediment reduction in the harbor.

- 2. Determine the average savings in yards of dredging saved per acre of buffer installed.
- 3. Develop a buffer model to predict the cumulative effect that widespread installation of conservation buffers would have on project goals.
- 4. Determine how the benefits of buffers interacted with the practice of conservation tillage.

The analysis was based on a literature review of studies documenting the effectiveness of conservation buffers (Findlay et al., 1991), the gross erosion estimates for the 1992 reference condition in the watershed, and the 1997 Ohio conservation tillage transect data. A copy of the complete analysis is attached (Appendix 4).

Buffer Analysis Model & Assumptions

The buffer analysis model was a spreadsheet which calculated before and after erosion and sediment delivery rates as new conservation buffers were applied to the watershed in different amounts. The after condition was compared to the 1992 reference condition. The model allowed for simultaneously varying the rate of conservation tillage applied to the landscape and credits for reduced erosion rates on the land taken out of production and devoted to buffers. Several assumptions were used in developing the model. These included:

- 1. It was assumed that <u>buffers</u> would be properly designed filter strips, filter basins, constructed wetlands, or sod waterways. Filter strips would be grass or tree strips adjacent to streams and watercourses in the flatter areas of the watershed. These strips would range in width from a minimum of 20 feet to a maximum of 100 feet. Consultations with field personnel indicated the average buffer width commonly used would be 35- 45 feet.
 - Filter basins or constructed wetlands would be circular or rectangular filter areas at the discharge outlets of drainage swales in the more rolling areas of the watershed.
- 2. The maximum area effectively protected by each one acre of buffer was assumed to be 15 acres. Beyond this ratio buffers would not be effective. This figure was used to calculate how many acres of buffers would be need to be applied in the watershed when "x" per cent of the fields were protected by buffers.
- 3. Based on literature reviews and field experiences, the buffers were assumed to trap 25% of the sediment which passed through each acre of buffer.
- 4. The fields draining into the buffers were protected by conservation tillage at the same percentage rate as the watershed as a whole.

Buffer Analysis Findings

The findings of the analysis were as follows:

- 1. Buffers could be highly effective in reducing sediment delivery to Toledo Harbor and make a significant contribution to achieving the soil conservation goal of reducing dredging by 130,000 cubic yards. Applying buffers to 30% of the corn and soybean fields could result for 29,000 cubic yards of sediment reduction and would represent approximately 20% of the goal. This level of treatment would require 58,330 acres of new conservation buffers (above 1992 conditions) to be installed in the watershed. Chart 8 shows the sediment reduction which can be achieved by various different levels of buffers and conservation tillage.
- 2. Buffers and conservation tillage act together to increase sediment reduction amounts to greater levels than either can achieve independently. Chart 8 shows the symbiotic interaction of buffers and conservation tillage which multiplies sediment reduction efforts. The effectiveness of conservation buffers is interconnected with the level of conservation tillage applied to the landscape. Each acre of buffer on the average, reduces dredging amounts by .383 to .497 cubic yards.

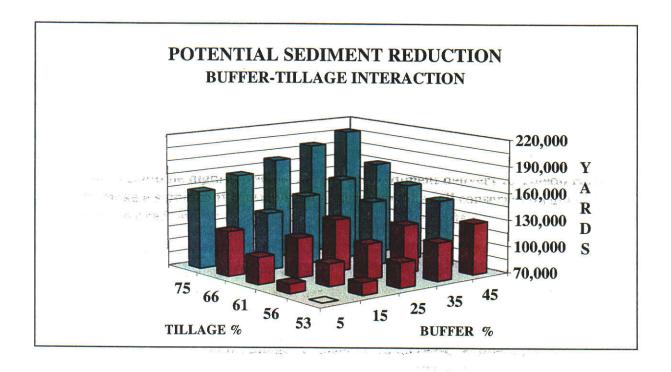


Chart 8 Impact of conservation tillage and buffers interaction on sediment reduction.

3. Buffers can insure that the 130,000 cubic yards goal is still attainable even if the original project goal of 75 per cent of the watershed in conservation tillage is not

attained. Additionally, if the project goals for conservation tillage can be attained, buffers can result in the Soil Conservation Plan contribution exceeding the original Toledo Harbor Project goals. Chart 9 shows in blue various combinations of buffer and tillage systems that would exceed project goals.

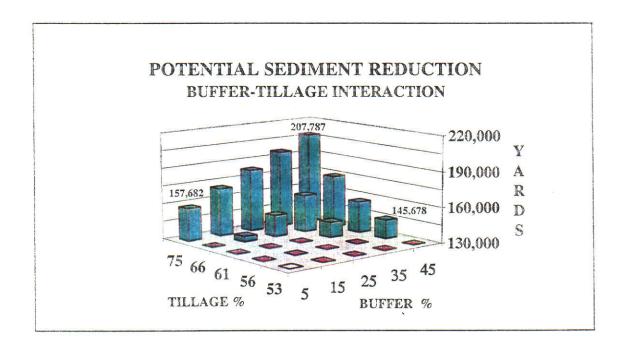


Chart 9 Combinations of buffer and conservation tillage amounts that would achieve the Soil Conservation Program goals.

- 4. It would be possible, but not likely, to achieve the Soil Conservation Program goals by either conservation tillage or conservation buffers alone. However, if only one of the practices is applied to the landscape very high amounts are necessary to achieve the goal. Combining the two practices will make the project goals more realistic and easier to achieve.
- 5. Buffer effectiveness is very elastic due to the low erosion rates and high levels of conservation tillage in the watershed. This makes the magnitude of the buffer contribution to sediment reduction fairly predictable. Chart 10 shows that the buffer contributions do not diminish very much even when an extremely conservative range of estimates of buffer efficiencies is used. This increases the confidence level of the analysis.

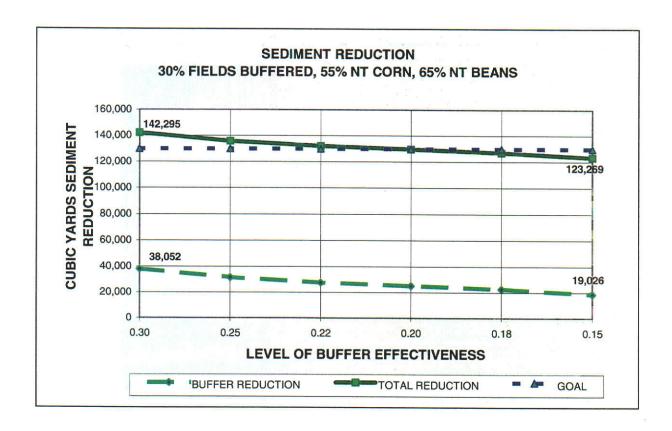
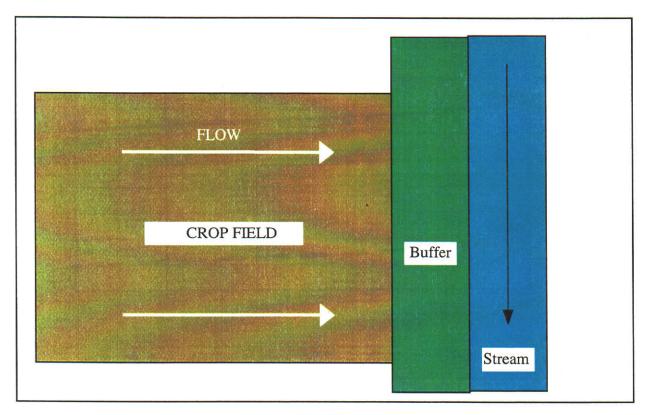


Chart 10 Changes in sediment reduction due to buffer at differing levels of buffer efficiencies.

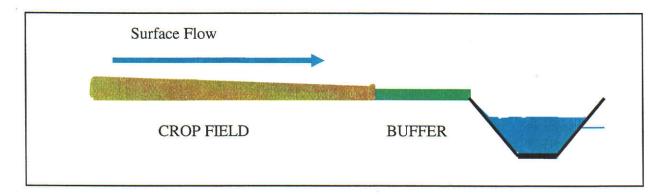
5. Two different types of buffers will be needed due to differences in landscape topography within the watershed. Filter strips are an existing commonly used and understood practice that will be applicable to the flatter fields in the watershed. (Figure 1)

However, the more rolling topography of the watershed is more suited to buffer "areas" which will be circular or square sedimentation basins. This will be new technology. The implementation will require enhancement and clarification of current incentive programs and technical standards, landowner education, demonstration projects, and follow-up evaluations in order to facilitate development of a long-term widespread program in the rolling upland areas of the watershed. Figure 2 shows a conceptual view of how buffers would fit in a rolling landscape.

Accelerating the rate of installation of both types of buffers will necessitate accelerated technical assistance (personnel) beyond that presently available from both NRCS and SWCD staff. Landowners will need on-site technical assistance in the field to insure that the buffers are designed and installed properly to get the maximum sediment reduction benefits.

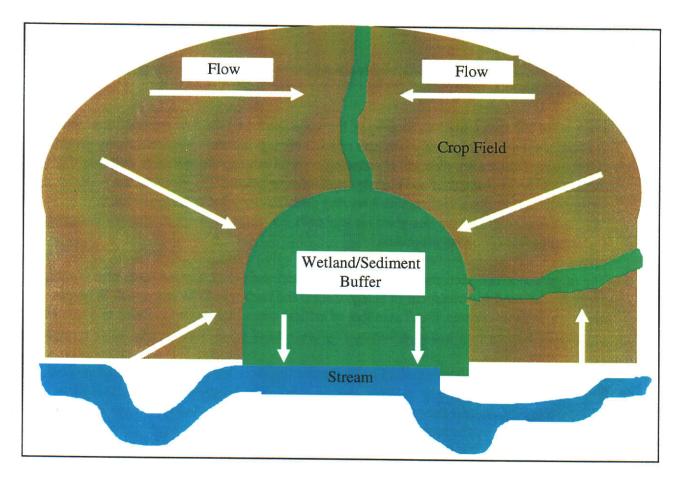


Top View

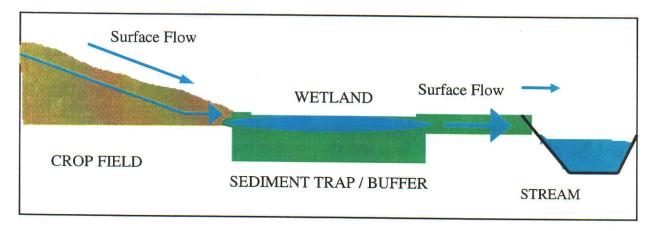


Profile View

Figure 1 Conceptual View of Flat Field w/ Filter Strip Serving as Conservation Buffer



Top View



Profile View

Figure 2 Conceptual View of Wetland/Sediment Basins as Conservation Buffers in Sloping Topography

All of these factors combine to make it difficult to identify and isolate any one area/areas as the source of the sediment problem. Additionally, the size of the watershed makes it very difficult to effectively apply computer simulation models to predict such areas. One tool that could be employed would be effective long term sediment monitoring of the major sub-watersheds. While excellent long term sediment data exists on the Maumee at the outlet, long term data is lacking for all of the various tributaries. Better sediment data on each of the major tributaries could make it easier to isolate the major sources of sediment. Two opportunities exist to help developed better sediment data on a sub-watershed basis. These opportunities are the Water Resources Development Act (WRDA) and the U.S. Geological Survey NWAQA Studies.

Water Resources Development Act

The Water Resources Development Act of 199_ (WRDA) authorized sediment transport modeling studies for the Great Lakes. The U.S. Army Corps of Engineers has selected Toledo Harbor and the Maumee River as one of the initial study sites. As part of the Toledo Harbor Project commitments NRCS is cooperating with the Corps on this project and participating as a member of the study team. This project has the potential to help increase the understanding of the sediment transport process within the watershed and increase the effective use of future Soil Conservation Program funds.

However, because of the sheer magnitude to the scope of this watershed, computer modeling or simulation alone will never provide a 'magic bullet" solution to the sediment problem. Such modeling can be most effective when coupled with long term sediment monitoring data collected from the major sub watersheds in the Maumee Basin. One of the recommendations of this report is that Water Resources Development Act planners consider establishing additional long term sediment monitoring stations of the major tributaries of the Maumee where they do not now exist.

National Water Quality Assessment Program (NWQA)

The National Water Quality Assessment Program (NWQA) is a program of the United States Geological Survey to assess water quality in selected watersheds across the United States. One of these watersheds is the Maumee River Watershed. As part of the NWQ project the USGS has recently reactivated and/or added sediment gauges to some of the tributaries within the Maumee Watershed. Data which could help provide a better understanding of the sediment picture is beginning to come in from some of these stations. NRCS is currently cooperating with USGS to provide it conservation tillage data on a sub-watershed basis and to help evaluate the data for any relationships between the levels of conservation tillage adoption within a watershed and the sediment loads that are measured.

NRCS considers the data being collected by USGS very valuable and one of the recommendations of this report is that long term monitoring be continued at the existing stations. It is also recommended that consideration be given to eliminating any gaps in the current network of stations. One such gap would be that the Blanchard River Watershed which is currently unmonitored for sediment. This is a sizable watershed with significant erosion rates and sediment data from the Blanchard would be very useful to the NRCS Soil Conservation Program.

Clearly the opportunities exist for gaining additional understanding of the erosion, transport, and sedimentation process within the Maumee River and the Toledo Harbor. These opportunities should be pursued and can lead to more efficient and cost effective Soil Conservation Programs as part of the Long Term Management Strategy. However, it should be noted that while modeling and monitoring may result in better use of program funds, they will not eliminate the need to treat very large number of acres within the watershed if the sediment reduction goal is to be reached. They should be considered one more tool in the sediment reduction toolkit, but not be viewed as a replacement for a widespread and comprehensive Soil Conservation Program utilizing conservation tillage and buffers on a majority of the watershed farms.

Chapter 9

PROJECT EVALUATION

NRCS asked local sediment committees and local SWCD offices to evaluate the project including the accomplishments and project strengths and weaknesses. Specifically the committees and individuals on the committees were asked to respond to three questions, including:

- 1. What were the positive aspects and the accomplishments of the project?
- 2. What were the negative experiences or limitations of the project?
- 3. What are the suggestions for improving the project in the future?

Eighteen different counties responded with more than 100 individual written comments. Appendix 5 contains a representative verbatim listing of the comments received from the committees and/or the committee members. There were numerous common themes throughout the various comments received. These are summarized as follows:

The committees liked the local sediment committee approach!

The majority of the comments received indicated that the committees liked the local sediment committee approach. This approach offered them the opportunity to develop local solutions which in turn helped sell the project to landowners. Counties commented that the committee approach strengthened partnerships with other organizations.

2. The sediment committee approach created more public awareness of the sediment problem in the harbor.

Several committees commented that both they and the public better understood the magnitude of the harbor and dredging problem. This was especially true for counties far up in the watershed away from the harbor, and also for those that attended the 1997 tour of the Port and the Harbor.

3. The committees felt that activities carried out resulted in actual sediment reduction on the land.

Numerous comments attested to the belief that the projects funded resulted in actual sediment reduction on the landscape. Several commented on the visibility in their local neighborhood of some of the practices funded such as filter strips. Comments were received as to the effect of observing reduced erosion.

4. The committees felt the local approach offered opportunities to develop new practices and work with new individuals.

Comments were received to the effect that the counties worked with new individuals who were attracted to the new programs. The approach offered flexibility, innovation and the opportunity to try new techniques. A particular benefit expressed was that the project offered opportunities to fund solutions which were not or could not be funded by traditional soil conservation programs.

5. The project suffered from lack of personnel resources and from poor timing.

Many comments were received to the effect that the program was one more program to implement without adequate staff resources to carry it out. As a result this hurt the communication, follow-up and documentation completed as part of the project.

The project timing coincided with the simultaneous introduction of numerous new USDA conservation programs and also agency reorganization and downsizing. Many of these new programs came with much different procedures and guidelines which required a considerable amount of time for the NRCS and SWCD field staffs to learn and implement. The new programs generated a large workload which had to be serviced with less personnel available. As a result of the timing, the field staff's were not able to devote as much time to the project as they wanted to or should have.

Because of the limited amount of funding available, NRCS committed three-fourths of the funding to the grant pool which would result in direct funding to landowners to implement sediment reduction projects on the land. It was felt it was important to be able to show results in the pilot project. The amount of funds used for personnel was limited to that needed to support the project coordinator position. In any future projects it will be necessary to utilize part of the funds received for personnel to provide the technical assistance needed to implement the project.

The project also coincided with the USDA initiation of the "Locally Led Process" which utilized Local County Work Groups to oversee USDA conservation programs at the county level. The concept of both the Toledo Harbor Local Sediment Committees and the USDA Local Work Groups is that local people can best address local conservation problems. In theory, these two groups should have come together as one and the same and both programs should have complemented each other. In most instances this happened. But, ironically, in a few cases the timing, the newness, and the two different terminologies served in the beginning to confuse people at the local county level. This problem has diminished with time as the field staffs have become more comfortable and familiar in working both with the project and also within the new locally led process.

The project also suffered from poor timing in that the project coordinator retired under optional retirement during the project as a result of a NRCS nationwide buyout opportunity. This necessitated the appointment of an acting project coordinator as a colateral duty since all existing project funding had been obligated or utilized. This served to delay the completion of this final report.

6. The project suffered from a lack of sufficient funding and no assurance of a longer term commitment. Numerous counties commented that one of the major limitations of the project was lack of adequate funding and stable long term funding.

The original NRCS Soil Conservation Proposal requested more than \$16.5 million over a 6 year implementation period and a 14 year maintenance period. The pilot project funded was for \$750, 000 over a two year period. The grant requests which came in could easily have used twice this amount. The project advisory committee felt it prudent to fund at least some grant projects in each county in order to gain awareness, exposure, and support for the demonstration project. This spread the available grant money fairly thin amongst the project counties. In some cases counties had elaborate strategies but only had the financial means to fund part of the activities. In other cases good ideas and grant requests were denied for lack of funds, or the funds allocated reduced below what was needed. This frustrated the local people.

In some cases the strategies contained projects that needed to be multi-year in scope to be effective. However, available funding was limited to two years and there was uncertainty as to if future funding was forthcoming. This limited the ideas in the local committee strategies to short term activities. In some cases it dampened enthusiasm because counties did not want to sell the project on a large scale basis with no long term resources or guarantee of funding.

7. Project communications and coordination were not always effective.

The committees offered several comments critical of project communications and of communications and leadership from the NRCS project coordinator. NRCS has taken steps to address these issues and improve leadership and communications.

Numerous other factors also affected project communications. The project commenced at a time of agency reorganization and downsizing within NRCS, which challenged all communication channels within the agency. Leadership changes also occurred in several positions in Ohio during this time period. The result was that it took a while for new communication lines to develop and for new people to learn and understand the project. NRCS has recently taken steps to restructure and improve lines of communication.

Communication was also affected by the lack of available staffing. Several ideas were proposed during the project that would have improved communication, including a project newsletter. However, these were never carried out due to lack of available staff time.

8. The project was hampered in the beginning by the lack of up front funding to NRCS and the local committees.

The different cultures of the Corps of Engineers and the NRCS hampered the project in the beginning. NRCS and Soil and Water Conservation Districts operate grant projects with money in hand. This is necessary because legally, local Soil and Water Conservation District supervisors can only obligate funds which they have. Landowners want firm commitments that their projects have been approved and funded before they go ahead. Under the structure of most conservation programs, grant funds are allocated to soil and water conservation districts who then proceed to obligate them to landowners and approve them on the basis of the grant guidelines and a conservation practice agreement. Funds are then paid to landowners when they complete the terms and conditions of the conservation practice agreement. In many cases landowners depend on quick turnaround of cost share reimbursement in order to have the financial means to carry out the practice. NRCS originally entered into this project with the assumption that it would be carried out in this manner.

Conversely, the Corps traditionally has operated on a contractual basis. It viewed the project as a contract for which NRCS would be paid project funds only after the contract was completed.

These differences served as obstacles to delay implementation of the project in the beginning by slowing transfer of funding. Eventually a procedure was worked out where NRCS, out of its own budget upfronted funds to the sediment committees so that they could operate. NRCS was willing and able to do this so as not to hinder the success of the pilot demonstration project. However, it cannot operate this way on a larger scale and in any future long term project a way must be found to upfront operating funds for the project.

9. The committees recommended the project continue with the approach of using grants to local sediment committees to provide local leadership and involvement.

The comments indicated solid support for continuing the project with the local sediment committee approach to the project. There were also numerous comments indicating the need to make improvements in the project limitations as discussed above. These include:

- Adequate Staffing
- Better Communication
- Adequate Funding
- Stable Long Term Funding
- Upfront Funding

Chapter 10

FUTURE RECOMMENDATIONS

The 1993 NRCS Erosion and Sedimentation Report contained a recommendation for long term funding of the recommended Soil Conservation Program at a level of \$16.5 million over a 20 year time period. The recommendation provided for 6 years of project implementation and 14 additional years of project benefits and maintenance. This recommendation still stands.

It is recommended that the Soil Conservation Program be implemented via a long term, stable, commitment of funding. The recommended program consists of 3 important components:

Recommendation 1. Continue funding the county sediment reduction

committees and locally led county sediment projects.

Recommendation 2. Accelerate the Conservation Buffer Initiative within the

Maumee Watershed.

Recommendation 3. Establish a Toledo Harbor Trust Fund to provide for

long term maintenance level activities after the project is

ended.

Recommendation 1

Continue County Sediment Reduction Program

NRCS is requesting a multi-year stable funding commitment to continue the pilot project and further implement the locally led sediment reduction projects over a 6 year time period. Continuing the county sediment program would:

Continue Grants to county sediment groups to implement sediment reduction strategies and projects.

- Continue cost sharing for NRCS and County Sediment Committees to allocate to landowners who install sediment reduction practices.
- Allocate additional technical assistance funds for NRCS personnel to lead the project and provide assistance on the land to landowners installing sediment reduction practices.
- Result in a conducting an information and education program within the watershed, including a project newsletter, tours and field days.
- Continue NRCS leadership for conservation tillage transects on a subwatershed basis each year.
- Include support for local conservation tillage clubs and conservation projects within the watershed.

These components of the program would require \$9,577,010 in funding and would be implemented over a 6 year time period. Eighty-five percent of the funds are earmarked for grants to committees, cost sharing with landowners, and information activities. Fifteen percent is needed for NRCS for personnel, for project leadership and project technical assistance.

action

The grant funds for project implementation, cost sharing, and county level information activities would be awarded to county sediment committees via a competitive process. Soil and Water Conservation Districts and/our county sediment committees, would, at their description, be allowed to utilize up to 15% of awarded grant funds for personnel to carry out the projects.

In order to improve communications, a project newsletter will be published at least 3 times per year. The project advisory committee will be revamped to include better representation of all the stakeholders within the watershed.

Recommendation 2

Accelerate The Conservation Buffer Initiative

NRCS is requesting funding to accelerate the Conservation Buffer Initiative within the Maumee Watershed. The accelerated buffer program will be used to increase the rate of conservation buffer installation beyond that which would occur under the normal USDA program efforts. NRCS is requesting \$3.9 million in funding to implement the buffer component over a 6 year time period. The accelerated buffer program would include the following components:

- Design, development, and installation of buffer demonstration projects
- Watershed grants to groups to carry out buffer projects on a sub-watershed basis
- Development of a riparian buffer forest preserve demonstration project along the major tributaries in the Maumee watershed
- Watershed wide buffer information program and <u>buffer tracking system</u> to monitor the rate of new buffer installations.
- Technical assistance funding for NRCS personnel
- A recommendation for a State Enhancement Program for the USDA Conservation Reserve Program.

Design, Development, and Installation of Buffer Demonstration Projects

The buffer demonstration program will include an integrated effort to:

- Develop design standards for wetland-sediment traps

- Identify ways to leverage Toledo Harbor Program funding with the Continuous CRP program to construct the traps

Construct and monitor demonstration projects using wetlands as sediment traps.

The design component will identify low cost ways of using gravity fed wetlands to trap sediment including determining appropriate watershed to wetland ratios, design depth, retention times, etc. The program component will identify ways to leverage project funds for this the practice with 15 year Continuous CRP contracts and will determine the level of incentives needed to gain landowner participation. The monitoring component will measure rates of sediment accumulations and/or outflow concentrations.

This project will be modeled after the Maumee Valley RC&D Marketing Wetlands for Profit project except that the focus will be on surface runoff - gravity fed wetlands without irrigation components in an effort to develop lower cost sediment traps. Scientists from the agricultural Research Service, Ohio State University and other institutions have expressed interest in this project and will be invited to participate in the monitoring and evaluation phase.

Approximately 20% of the accelerated buffer program funds (\$775,000) will be budgeted towards this activity with the goal of establishing 21 one demonstration projects (one in each

county) over the 6 years of the project. These funds will be leveraged with Continuous CRP funding.

Watershed Grants For Sub-Watershed Groups To Carry Out Buffer Projects

Approximately 20 percent of the accelerated buffer program funds (\$775,000) will be made available to watershed groups to carry out watershed based buffer promotions on the major subwatersheds in the Maumee Basin. These funds will be allocated on a competitive grant basis. They will be available for cost sharing and/or information and education to implement buffer projects.

Development Of A Riparian Buffer Forest Preserve Demonstration Project Along The Major Tributaries In The Maumee Watershed

Approximately 9% of the accelerated buffer program financial assistance funds (\$350,000) will be allocated design a project to plant Riparian Forest Buffers along the major tributaries in the watershed. The proposed concept will be to use the Continuous CRP to plant forest buffers with a 15 year contract. Simultaneously, project funds will be used to purchase a 20 to 30 year easement that is effective at the end of the CRP contract. The goal will be to provide the landowner an annual return until the trees reach a size that they become income generating and the forest is self sustaining. A goal of 70 acres per year will be established or 350 acres over the life of the project. At an average width of 50 feet this would equal 58 miles of riparian buffers.

The goal of this program will be to demonstrate program and funding mechanisms that could be used on a large scale basis to treat the entire watershed

Watershed Wide Buffer Information and Tracking Program

Approximately 5 percent of the accelerated buffer program funds (\$200,000) will be utilized for a conservation buffer information education program within the watershed. Watershed specific informational materials will be developed. Results of the wetland sediment traps studies will be published. A system for tracking and monitoring buffer installation rates will be developed.

NRCS Technical Assistance

Approximately 46 per cent of the accelerated buffer program funds (\$1,800,000) are designated for NRCS technical assistance to lead the accelerated buffer program and provide technical assistance to landowners who install buffer practices.

State Enhancement of the Continuous CRP Program

One of the key tools that will be used to install the Conservation Buffer Practices on a large scale in the watershed will be the Continuous Signup provisions of the existing USDA Conservation Reserve Program (CRP). The Continuous CRP program is currently funded by USDA and allows landowners to convert cropland to the conservation buffer practices of filter strips, grass waterways, riparian forest buffers, and restored wetlands. Landowners agree to convert cropland to these practices in exchange for a 10 to 15 year contract with USDA. The contract provides for annual rental payments which reimburse the landowner for the loss of income on this land. The program is currently popular within the Maumee Basin. Reimbursement is at the Federally established rates and landowners of eligible cropland are automatically eligible to enroll in the program. Widespread participation in this program would result in substantial sediment reduction.

A provisions in the USDA Conservation Reserve Program provides for state enhancement of the federal CRP program. State Enhancement of the CRP in the Maumee Watershed would provide the following benefits:

- 1. The additional state incentives could be used to increase rental rates beyond the federal maximum to increase participation rates for some or all of the conservation buffer practices.
- 2. The additional state enhancement efforts could be targeted to the most critical practices within the watershed such as the more erosive subwatersheds or along stream corridors.
- 3. The state enhancement incentives could support increased cost-sharing of designing and constructing some practices, such as restored wetlands, to achieve increased the sediment trapping efficiency.

State Enhancement of the Continuous CRP requires that state government or non-USDA funding be utilized for the enhancement portion of the CRP program. This results in a leveraging of USDA funds. Currently numerous states such as Pennsylvania, Illinois, Kansas, and Minnesota have enacted state CRP enhancement programs. Increases in conservation buffer application rates have been experienced where such programs have been put into effect. This would be the expected effect in the Maumee watershed as well. Ohio currently does not have a state enhancement program.

It is recommended as a part of the accelerated conservation buffer program that the executive committee go on record as supporting a State CRP Enhancement program for

the Maumee Watershed and actively explore a partnership with the State of Ohio which would result in the development of a State Enhanced CRP Program for the Maumee Watershed.

Recommendation 3

Establish A Toledo Harbor Trust Fund

The programs and practices within the Soil Conservation Program are designed to provide long term enduring conservation benefits which will persist long after the project is finished. However, over the long term, resource conditions may change, new landowners arrive and a new generation will inherit the land. It will require continued education of these new landowners and continued promotional efforts to maintain the benefits that will be gained as a result of implementing this program.

For this reason the 1993 Erosion and Sedimentation Report recommended establishment of a maintenance fund to conduct a maintenance level program in years 7-20. This report further develops that concept of a maintenance fund as a trust fund.

It is recommended that a **Toledo Harbor Trust Fund** be created. This fund would be modeled after the Lake Erie Protection Fund. The purpose would be to provide a long term dedicated source of funding to be used for maintenance of sediment reduction activities in the Maumee Watershed.

It is recommended that this fund be established at a level of approximately \$6 million through 6 annual contributions of \$1,000,000.

The interest from this fund would be available annually, starting in year 30r 4 of the project, to fund, via competitive grants, continued sediment reduction activities within the watershed. Local sediment committees, units of governments, conservation organizations, and researchers would be eligible to apply for funding.

Creation and administration of this fund would require an entity that is charged with leadership for the fund and is capable of the appropriate financial expertise and safeguards to properly administer and disperse the grant funds. It is assumed that the administering entity would administer the fund on a percentage basis. This report does not presume to identify or recommend an administrator of the proposed fund. Clearly there are some challenges in implementing this idea. Several possible options as to how the fund might be administered are suggested for further exploration and discussion:

Option 1 Administer as a sub-fund within the Lake Erie Protection Fund.

The Ohio Lake Erie Office currently administers the Lake Erie Protection Fund. One alternative to explore further would be for this organization to administer a Toledo Harbor Trust Fund either parallel to or as a separate and distinct sub-fund within the existing Lake Erie Protection Fund. The advantage of this approach would be that the administering organization would already have in place the structure, expertise and experience needed to administer the fund. It is recommended that the feasibility of adopting this alternative be further explored.

Option 2 Create a NRCS Natural Resource Foundation.

A second option which might be considered would be the creation of a Natural Resource Foundation within or by the Natural Resources Conservation Service. The 1996 Farm Bill vested in NRCS the authority to create Natural Resource Foundation(s). This is a new authority and NRCS, particularly at the state level does not yet have experience or a track record in this area. It is uncertain as to how feasible this option is and it is recommended that this option be further explored to determine if this USDA authority could be applicable.

Option 3 Utilize a private non-profit foundation.

A third option might be to identify a private non-profit foundation that would be capable and willing to administer the fund under long term contract. Obviously there could be many challenges with this approach. However, given the right fit and the right contractual arrangements, this option might be a feasible alternative. It is recommended this alternative be further explored.

This report does not presume to recommend any of the above as viable or preferred alternatives. What is recommended is a long term stable maintenance component for the project and the idea of a trust fund could be one alternative that would achieve that goal and should be explored further.

Summary of Funding Recommendations

The funding recommended in the 1993 NRCS Erosion and Sedimentation Report for the Soil Conservation Program was recommended at \$16,493,245. This report reaffirms that 1993 recommendation, adjusted for inflation, as the needed level of funding. Table 6 contains the total funding recommendation, distributed by activity and by program year.

The County Sediment program is recommended for funding at \$9,521,011, the same level as was recommended in the 1993 report.

The Accelerated Conservation Buffer Program was not contained in the 1993 recommendation. It is added to this report as a 6 year period program with a requested funding level of \$3,900,000.

The Maintenance Fund was recommended for funding at \$6,943,232 in the 1993 report. This report recommends funding for that activity at a level of \$6,000,000. It recommends establishment of a trust fund as the vehicle for holding and distributing maintenance funds.

Funding of the total project funds is distributed at 52% financial assistance for funding project financial measures for the county sediment programs and the accelerated buffer initiative, approximately 18% technical assistance for funding NRCS personnel to assist landowners in carrying out the project, and 30% funding for the Trust Fund for long term maintenance.

The order of funding priority of the 3 components, in the view of NRCS, is as follows:

1st Priority Continue County Sediment Reduction Program
 2nd Priority Accelerate Conservation Buffer Program
 3rd Priority Establish Toledo Harbor Trust Fund

The total funding level of \$19,477,010 represents an increase of \$2,488,970 over the 1993 report. This increase is equal to an annual inflation rate of slightly less than 3 percent.

Funding Sources

It is recommended that two sources of funding be utilized to implement the three recommendations in this report. These include:

- 1. Redirection of Dredging Funds
- 2. 1996 Water Resources Development Act Funding

Redirection of Dredging Funds

Funds used to dredge are collected from shippers. As such they represent a user fee on those who would benefit from keeping the harbor open. During preparation of the LTMS Phase III report, after much debate the study team arrived at the consensus that it made sense to use such funds for prevention of a dredging problem rather than remediation after the sediment had settled out in the harbor.

This report further reaffirms that original recommendation of the study team that the appropriate source for the funding of the Soil Conservation Program would be redirecting of a portion of the dredging funds to upland land treatment programs.

This report further suggests that the accomplishments of this pilot project indicate that such an approach can achieve sediment reduction, and that the Ohio State University Economic Analysis supports the cost effectiveness of doing this.

Water Resources Development Act

The 1996 Water Resources Development Act (WRDA) provided for sediment transport modeling in the Great Lakes Harbors. The act authorizes appropriations of \$5 million per year over a 5 year period for a total authorization of \$25 million. In fiscal year 1998 \$1.5 million was appropriated to initiate projects on 3 harbors in the Great Lakes, one of which is Toledo.

According to the authors of the original legislation which served as the basis of the act, the intent of Congress was for this funding to go far beyond just studies and support actual programs which implemented sediment reduction within the watershed (Allegra Cangelosi, Northeast-Midwest Institute, personal communication).

This report asserts that the 3 recommendations for the Soil Conservation Programs represent the kinds of sediment reduction implementation envisioned by Congress under the Water Resources Development Act.

Recommended Funding For Soil Conservation Program Table 5

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Total
Continue County Sediment Reduction		Program					
Financial Assistance To Landowners/SWCD's	\$1,322,520	\$1,322,520	\$1,322,520	\$1,322,520	\$1,322,520	\$1,322,520	\$7,935,122
Technical Assistance - NRCS	252,648	252,648	252,648	252,648	252,648	252,648	1,509,889
County Steering Committees	2,100	2,100	2,100	2,100	2,100	2,100	126,000
	\$1,596,168	\$1,596,168	\$1,596,168	\$1,596,168	\$1,596,168	\$1,596,168	\$9,577,010
Accelerate Conservation Buffer Program	Buffer Progra	=					
Financial Assistance For Buffer Projects	\$ 350,000	\$ 350,000	\$ 350,000	\$ 350,000	\$ 350,000	\$350,000	\$2,100,000
Technical Assistance - NRCS	\$ 300,000	\$ 300,000	\$ 300,000	\$ 300,000	\$ 300,000	\$ 300,000	\$1,800,000
	\$ 650,000	\$ 650,000	\$ 650,000	\$ 650,000	\$ 650,000	\$ 650,000	\$3,900,000
Establish Toledo Harbor Trust Fund	Trust Fund						
Financial Assistance	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	\$1,000,000	86,000,000
PROJECT TOTAL	\$3,246,168	\$3,246,168	\$3,246,168	\$3,246,168	\$3,246,168	\$3,246,168	\$19,477,010

Chapter 11

CONCLUSIONS

The Toledo Harbor Pilot Project was a two year pilot project to demonstrate the effectiveness of using conservation tillage to reduce sediment delivery to the Toledo Harbor. The project used a locally led approach including county sediment committees, county sediment reduction strategies, and competitive grants to distribute available grant funds. Specific conclusions of the pilot project are:

- 1. The project successfully demonstrated a delivery system which can be effective in accelerating the rate of application of sediment reduction practices within the Maumee Watershed. Twenty two of the twenty five counties developed county sediment reduction strategies. The locally led process created public awareness of the harbor problem. The process resulted in local committees taking ownership of finding solutions. The committees reported that actual changes were put into effect on the landscape. Collectively, the county sediment committees liked the local sediment committee approach and found it effective.
- 2. The two year project did not provide enough time to demonstrate actual changes in the sedimentation rate in the harbor. Actual sediment loading depends on year to year storm events and is highly variable. Additionally, there is expected to be a lag time between when sediment leaves the farm field and when it finally shows up in the harbor as it works its way through the drainage system in the basin. For this reason the measure of success has to be long term changes over a period of time. The two year project period was not sufficient enough time to demonstrate this.
- The project was effective in developing partnerships with others to amplify the sediment reduction efforts. Over 44 different and distinct organizations participated by serving on the sediment committees and helping to develop and implement the strategies. Nine different types of organizations were represented on the committees, ranging from Federal, State and Local governments to private environmental groups and agribusiness organizations.

- 4. NRCS and Soil and Water Conservation Districts invested considerable staff time in carrying out the project. Each entity provided approximately \$140,000 worth of staff time to implement the project at the field office level. This amounted to 26 percent (13% each) of the total project expenditures.
- The process resulted in effective use of project funds. Seventy-five per cent of the Corps of Engineers funding went to the county sediment committees to implement the sediment reduction strategies. Fifty-seven percent of the county grant funds were used for the highest priority practice of conservation tillage. The other funds were used to implement new and innovative ideas, including promotion of filter strips and conservation buffers.
- 6. The project generated many innovative ideas for promoting conservation tillage and sediment reduction activities. These included such things as:

No-till equipment co-ops Invention of row dryer tools Strip tillage demonstrations Outreach to small farmers

- 7. Conservation tillage trends increased in the Toledo Harbor Ohio Counties during the project period as compared to all Ohio Counties. At the end of the two year project period the conservation tillage in the Toledo Counties exceeded the average for the state as a whole by 9%.
- 8. Three separate analysis of conservation tillage trends were conducted as part of the project. In each analysis, conservation tillage rates in counties in accelerated project areas exceeded conservation tillage rates in similar non project counties. The increases were:

Toledo Harbor counties vs non Toledo Harbor counties	9%
Section 319 counties versus non Section 319 counties	8%
Conservation Action Project (CAP) counties versus non CAP	15%

The Lake Eric Agricultural Systems for Environmental Quality Study found that sediment concentrations in the Maumee River decreased by 20% as a result of application of best management practices over a twenty year period. This independent study was conducted by Heidleberg College, Case Western Reserve University, and The Ohio State University.

- Based on extrapolation of the existing Ohio Conservation Tillage Transect
 Data, the progress (since 1992) towards the 130,000 cubic yard goal is 69,353
 cubic yards, or 53 per cent of the goal. A more detailed analysis of gross erosion is currently being updated and will be provided as an addendum to this report.
- 11. A study by economists at The Ohio State university concluded that a 15 percent reduction in dredging would provide a present market value of reduced dredging costs worth \$1.3 million per year. The study measured the savings in dredging only and did not place any value on other environmental benefits received such as improved recreation values or improved fish and wildlife habitat.
- 12. As part of the project NRCS prepared a detailed conservation buffer analysis to determine the effect that widespread application of conservation buffers would have on sediment reduction in the Toledo Harbor. The analysis found that:
 - Properly designed and installed buffers could trap as much as 25% of the sediment passing through them. The beneficial effects of buffers are very elastic when combined with the practice of conservation tillage.
 - Buffers and tillage interact in a synergistic manner.
 - Applying conservation buffer protection to 35 percent of the corn and soybean fields could result in 29,000 cubic yards of sediment reduction which would represent 20 percent of project goals.

 Approximately 68,000 acres of new conservation buffer practices would need to be installed to achieve this level of protection
 - Meeting reasonable goals for both conservation buffers and conservation tillage systems could result in exceeding project goals.
 - It is not likely that the project goals can be attained with either practice alone and by itself.
- 13. Two types of buffer systems will be needed. One is the commonly understood filter strip practice which is applicable to flat landscapes. A second and new practice which will be needed is wetland sediment traps which will be appropriate in the more rolling landscapes. Demonstrations are needed to gain experience in

designing and constructing this practice. The demonstrations are also needed to refine the delivery and incentive programs which will be necessary for widespread acceptance and installation by landowners.

- 14. Sediment modeling under the Water Resources Development Act will provide an opportunity to make more effective use of project funds but it will not replace the need for widespread adoption of conservation tillage and conservation buffers in the watershed. The size of the watershed makes it very difficult and expensive to apply traditional watershed predictive models. The low erosion rates and large number of cropland acres will require a large percentage of the watershed to be treated.
- 15. It would improve project efficiency to have additional sediment monitoring stations installed on watersheds where they do not now exist. A complete set of long term sediment data by sub-watershed would help design a more efficient sediment reduction program. The Blanchard River Watershed, among others, is one major sub-watershed which is lacking is sediment loading data. Collecting actual sediment monitoring data for the major sub-watersheds appears to be more useful than computer modeling of the watershed.
- The project suffered from a lack of personnel, a lack of sufficient funds, and poor timing due to competition with other newly released USDA programs. Future efforts will necessitate adequate personnel funding be provided as part of the project. While the new USDA programs competed with the pilot project, these new programs have now stabilized and the programs can be a valuable component of future project efforts if adequate personnel funding is available to implement them.
- 17. Project communications needed to be improved and NRCS has taken steps to accomplish that.
- 18. The project was hindered in the beginning by a lack of up front funding.

 Future projects need to include up front funding as part of the process order to allow NRCS and Soil and Water Conservation Districts to operate within agency authorities and laws.

- 19. The recommended future Soil Conservation Program as a component of the LTMS, consists of three elements:
 - Continued funding of the county sediment reduction committees and county sediment reduction programs.
 - Acceleration of the conservation buffer initiative within the watershed.
 - Establishment of a Toledo Harbor Trust Fund, modeled on the Lake Erie protection fund, to provide for long term project maintenance
- 20. The recommended funding level for the future Soil Conservation Program is \$16.5 million. This includes:
 - Approximately \$9.5 million for the continuing the county locally led sediment reduction programs to promote conservation tillage and other sediment reduction practices.
 - Approximately \$2 million for accelerating the conservation buffer initiative in the Maumee Watershed.
 - Approximately \$5 million for a Toledo Harbor Trust Fund to provide long term maintenance.

Fifteen percent of the recommended funding for the locally led sediment reduction programs and the accelerated buffer program is designated for NRCS technical assistance to implement the program.

- The recommended source of this funding is redirection of dredging funds.

 This mechanism of funding would utilize a user fee collected from those who benefit from protecting the harbor. An additional recommended source of funding is the 1996 Water Resources Development Act.
- The Natural Resource Conservation Service is recommended as the lead agency for implementing the locally led sediment reduction program and the accelerated conservation buffer program. The lead agency for the Toledo Harbor Trust Fund is yet to be determined.
- 23. NRCS and the conservation partners stand ready to implement a long term sediment reeducation program when and if a stable multi-year funding is provided.

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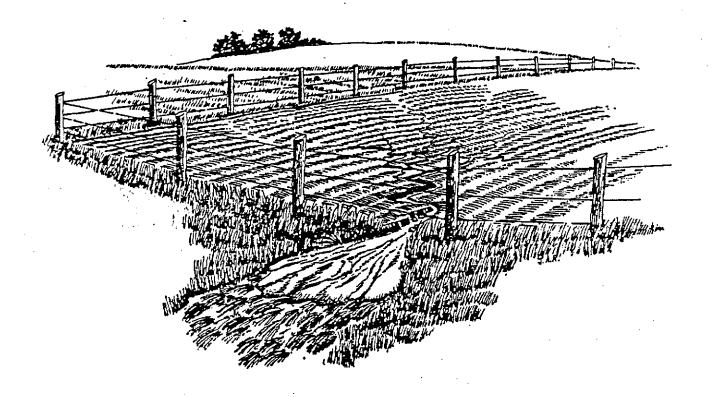
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Appendix 1

Erosion and Sedimentation Dynamics of the Maumee River Basin and Their Impact on Toledo Harbor



February 1993

USDA, Soil Conservation Service

L Introduction

The Maumee River Basin drains 4,230,000 acres from three states. Agricultural and forestland comprise the majority of land use in the basin. There are approximately 3,300,000 acres of cropland, 50,000 acres of pasture land, 100,000 acres of farmsteads, and 300,000 acres of forestland in the basin. The remainder of the acreage consists of urban and built-up land and land devoted to miscellaneous and rural transportation uses.

IL Physiology and Geology and Soils

The basin is shaped like a round saucer with flat lake plains in the low center, sloping till plains around the higher periphery, and beach ridges scattered in between. The basin lies in the glaciated lake and till plains of the central low lands physiographic province. The central and lower portion of the basin is in Major Land Resource Area (MLRA) 99, Erie Huron Plain. This section has a nearly flat to gently undulating surface veneered with lacustrine (lake) deposits. Relief is generally 5 to 10 feet, but in some areas near streams it may reach 20 feet. The periphery of the basin is in MLRA 111, Indiana and Ohio Till Plain. Till plain land is relatively flat to undulating and characterized by broken ridges (end moraines) roughly paralleling the shore of Lake Erie.

Bedrock exposures are rare in the basin. Streams of the Maumee River system are mostly of flat gradient, except for the St. Joseph River headwaters in Hillsdale County, Michigan. This stream flows southwest through Williams County, Ohio, to Fort Wayne in Allen County, Indiana, where it joins stream flow from the St. Marys River flowing northwest to form the Maumee River. The Maumee then flows northeast to Lake Erie at Toledo. Two other streams join the Maumee River at Defiance. The Tiffin River flows south from Hillsdale and Lenawee Counties, Michigan, and the Auglaize-Blanchard River systems which drain much of the southern portion of the Maumee Basin.

The Maumee River from Fort Wayne to Toledo has an average slope of 1.3 feet per mile; St. Marys 2.8 ft/mi; St. Joseph 1.6; Tiffin 1.2; Auglaize 3.2; Little Auglaize 2.5; and Blanchard 0.9 feet per mile. Some of the headwater streams have a fall of 10 feet per mile.

The soils in the Maumee River Basin are predominantly nearly level to gently sloping. They are very poorly to somewhat poorly drained, moderately fine to fine textured, and formed in lacustrine and till material. In local areas throughout the basin, there are better drained soils, such as sloping soils and gravelly and sandy soils, and a few bog soil areas. Alluvial soils in the basin are mostly dark colored and very poorly drained.

III. Recent History of Maumee Basin

Settlement by people of European decent was later than that of surrounding lands because of the nearly impassable "Black Swamp" that covered the central and lower part of the basin. Early settlers located on land along the streams and creeks. Little progress was made in settling the rest of the county until methods of draining the swamp were developed about the time of the Civil War. At first the wet areas were drained by open ditches and subsurface wooden drains, but later clay, concrete, and plastic lines replaced the wooden drains.

As more and more acreage was cleared and drained, the land was opened to the process of accelerated erosion and sedimentation. Initially, the field sizes were small, 5 to 10 acres, and small grain and hay rotations were used to control weeds and pests. Small field sizes and long rotations provided a reasonable measure of erosion and sediment control until the period following World War II.

The mechanical and chemical technology developed during the war years was adapted to the farm equipment arena. With the ever increasing power and size of farm machinery, fence rows were eliminated and the size of fields increased. By the late 1960's and early 1970's, a combination of high commodity prices and the use of agricultural chemicals led farm operators to remove the remaining fences and concentrate on basically arow crop rotation.

The crops grown in the basin are corn, soybeans, wheat, oats, hay, vegetables, nursery, and government set aside programs. Depending on weather and government programs, the approximate percentage of cropland devoted to the above crops are: 1/

Government-5%

IV. Watershed Erosion

Watershederosion by water consists of three defined types: sheet and rillerosion, gully erosion, and streambank erosion. Estimates of sheet and rill erosion show that since about 1955 approximately 10,200,000 tons of soil eroded (detached from the soil surface) in the Maumee Basin on an average annual basis. It reambank and gully erosion were estimated to be 100,000 tons per year. Total watershed erosion for this period would average approximately 10,300,000 tons per year.

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- USDA, Soil Conservation Service. National Resources Inventory. 1982.
- Maumee River Basin, Level B Study. Erosion and Sedimentation Technical Paper. August 1975.

V. Transport of Eroded Material

Only a portion of the soil that is eroded within a basin is transported to the mouth of the basin. Some soil remains in upland fields or is trapped in floodplains, channels, lakes, and ponds. The Waterville Gauge on the Maumee River at Waterville, Ohio, has measured an average annual suspended sediment load of 1,300,000 tons. Since 1951, 1/2 this load represents most of the sediment that enters Toledo Harbor, but is only 12 percent of the 10,259,000 tons of soil that has eroded within the basin annually. This percentage is termed a delivery rate or delivery ratio.

A sediment rating curve was developed for discharge and sediment load data from the Waterville Gauge. This relationship shows that the sediment load increases in linear proportion to water discharge. This relationship is further demonstrated by plotting annual sediment load against average annual water discharge as displayed in the graph "Water and Sediment Discharge for Maumee River Basin." 2/

The "Sediment Discharge Ratio A/B" graph is an attempt to neutralize the impact of water discharge cycles in order to isolate cycles of sediment availability. The graph is elevated for periods 1951-1957 and 1972-1976. These elevations may correspond to post war changes in agricultural management and later to the row crop rotation which was induced by commodity price increases and extensive use of agricultural chemicals (see section entitled "Recent History of Maumee Basin").

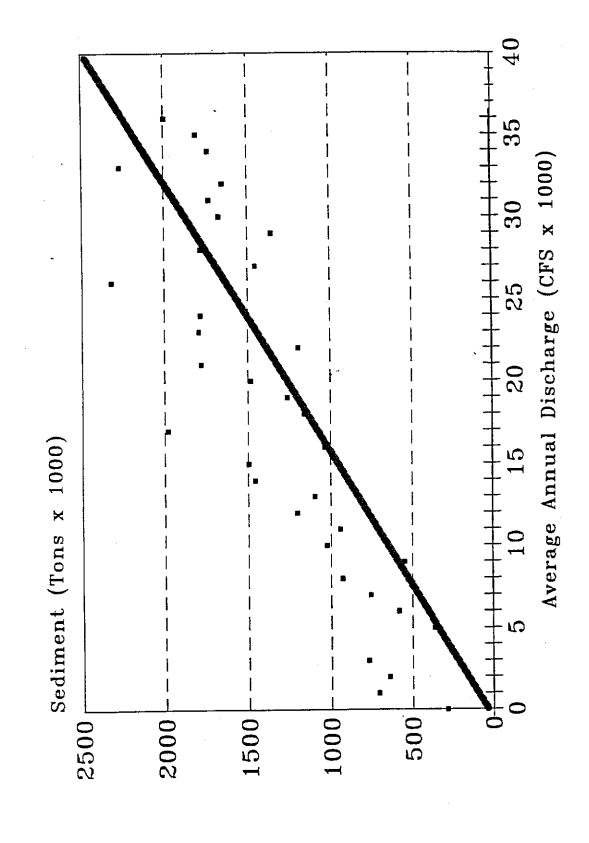
VI. Fluvial Sedimentation Dynamics in the Toledo Harbor

As stated previously in this document, approximately 1,268,000 tons of sediment annually passes the USGS stream gauge at Waterville, Ohio. A portion of this material is deposited in the ship channel each year. The U.S. Army Corps of Engineers reports that an average of 780,000 cubic yards of sediment are dredged from the ship channel annually. 3/

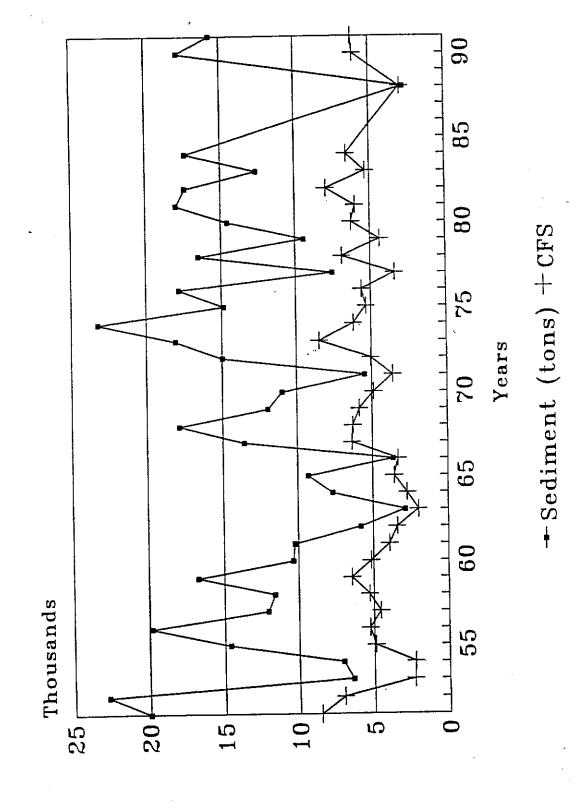
Available data on situ sediments in the Maumee Basin indicate average densities of approximately 40 pounds per cubic foot. At this density, the dredged mass would average approximately 421,200 tons annually, or 33 percent of the sediment that passes the Waterville Stream Gauge. The value of 33 percent is the average sediment trap efficiency of the ship channel. This value was also evaluated by imperical methods using sediment type, ship channel capacity, and average annual watervolume discharged into the channel. These calculations indicate a trap efficiency of 32 percent. 5/

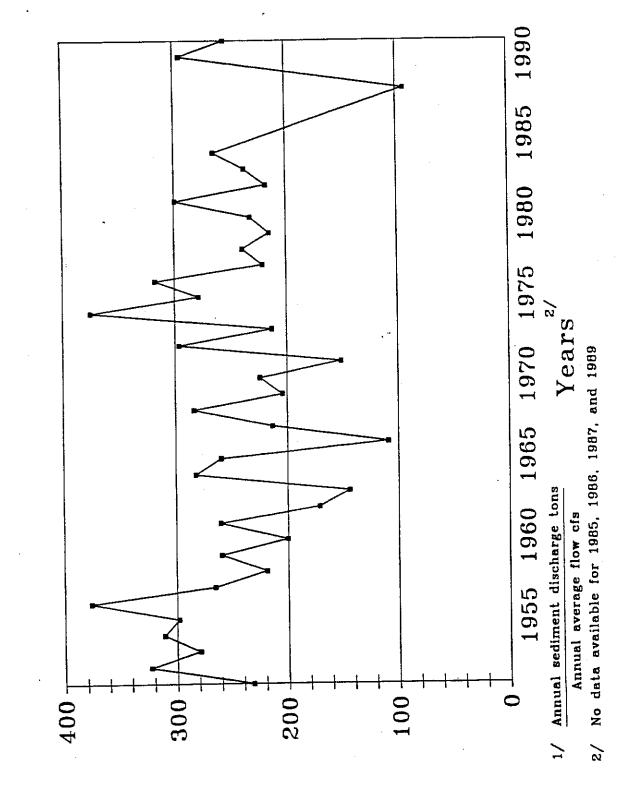
- ¥ U.S Geological Survey Data. 1992.
- 2 Data was not obtained in water years 1985, 86, 87, 88, and 89.
- U.S. Army Corps of Engineers, Buffalo District. "Environmental Assessment and Finding of No Significant Impact Operations and Maintenance for Toledo Harbor, Lucas County, Ohio." February 1989.
- USDA, Soil Conservation Service. "Impact of Erosion and Conservation on Lakes in Ohio." August 1990.
- USDA, Soil Conservation Service. National Engineering Handbook, Section 3, Sedimentation.

Sediment Rating Curve nee River – Waterville Gauge Maumee River



Water and Sediment Discharge for Maumee River Basin





VII. Methodology of Analysis Used to Determine Sedimentation Reductions in the Toledo Harbor Due to Erosion Reductions on Basin Soils

The reduction of soil erosion on the land in the basin will reduce the amount of sediment delivered to the harbor.

This analysis utilizes the following parameters:

- a. Soilloss reduction in tons per year. 1/
- b. Basin delivery rate (approximately 10 percent).
- c. Ship channel trap efficiency (approximately 32 percent).

The relationship is:

Annual basin soil loss reduction (tons) x basin delivery rate x ship channel trap efficiency = annual tonnage reduction of sediment deposited in the ship channel (one ton = 1.85 cubic yards).

A hypothetical example would be:

Given:

- a. Annual soil loss reduction of 1,000 tons
- b. Delivery rate of approximately 10 percent
- c. Ship channel trap efficiency of 32 percent

 $1,000 \text{ t/yr} \times 0.1 \times 0.32 = 32 \text{ t/yr}$

32 t/yt x 1.85 cu yd/t = 59.2 cu/yd

VIII. Erosion Reduction Methods

Over 90 percent of the erosion occurring in the basin occurs as a result of crop production. An additional 3 to 4 percent comes from gully and largerillerosion and the rest comes from all other sources. Therefore, the obvious place to begin an analysis of erosion reduction is in the cropland area. Seventy-five percent of the cropland acreage (about 2.5 million acres) is planted to corn and soybeans each year. While most sources of erosion and most methods of control will be analyzed, our recommended alternative will be to increase crop residue management through decreased tillage.

There are two broad categories of erosion control, one is through change in annual management and the other is the installation of permanent "structural practices."

A. Management practices for erosion control fall into two subcategories, crop residue management and conservation cropping sequence.

1. Crop Residue Management:

Crop residue management consists of a management system where the farmer reduces the amount of annual tillage to the point where a specified amount (30 to 100 percent of the soil surface covered with the previous crop residue after planting) of crop residue covers the soil surface from harvest through the planting of the next crop. This usually requires specialized, but not scarce, equipment.

- a. No-Till planting means the soil is not tilled from the time of the harvest of the previous crop until the planting of the following crop. This is one of the recommended alternatives.
- b. Conservation Tillage means that the soil is tilled after harvest, but is tilled in such a manner that at least 30 percent of the soil surface is covered with the previous crop residue after planting. To save 146,000 cubic yards of dredging would require that 80 percent of the corn and soybean acreages to be in a crop residue management system. This is one of the recommended alternatives.

2. Conservation Cropping Sequence:

Conservation cropping sequence is the addition or substitution of certain types of crops in a rotation such as hay and small grains that are less conducive to erosion than corn and soybeans. These crops are desirable because the plant spacings are very close and the soil surface is protected more quickly than corn or soybeans.

a. Hay

Hay is an environmentally friendly crop, but there are problems in increasing acreages of this crop. The problems are perception, market, and government programs. The perception is that hay is not a moneymaking crop and is too labor intensive to grow. There is no set price or local delivery locations as there are for corn and soybeans. Also, hay is not a commodity crop so there is no government subsidy.

One advantage is that each acre converted to hay reduces the same amount of erosion as two acres of crop residue management because of the superior erosion protection. To reduce 146,000 cubic yards of sediment in the harbor would require the conversion of 500,000 acres of cropland from corn and soybeans to hay. This is highly unlikely in the short term, but in the long term some additional acres could be converted. A look at the impacts of this crop and additional markets is recommended for long range study.

b. Small Grains - Wheat and Oats

1. Oats

While the demand for oat products remains high, most of the oats for human consumption are imported. There are no government subsidies for oats and the average price is around \$1.40 per bushel. With yields averaging 50 to 70 bushels per acre, gross returns are only \$70 to \$100 per acre. This barely covers the cost of land rental payments. No further action is recommended at this time.

2. Wheat

Wheat is a subsidized crop and acreage limitations are imposed yearly on this commodity crop. Significant increases in acreages are unlikely because those individuals who increase wheat acres more than their allotment would be ineligible for all government crop subsidies. Without these dollars being replaced from some other source, this is not going to happen. No further action is recommended at this time.

3. Alternative Crops

At least one alternative crop—canol—appears to have a chance at increasing acreage with additional assistance. Canola provides an excellent winter cover and would be beneficial to erosion reductions in the basin if included in the rotation. It is usually substituted for soybeans. Limitations are one of scale and market. The market infrastructure will not gear up to handle canola because it requires separate bins and management and the farmer will not raise it because there is no local market to deliver to and obtain the same pricing service that they get from com and soybeans. It is recommended that this alternative crop be explored in the long range.

3. Structural Measures

Structural practices are those erosion reduction efforts that last more than one year, usually 10 to 20 years with maintenance, and provide an accumulated erosion savings over time. They usually require off-farm assistance for design and installation. In the basin, these would be filter strips, grass waterways, streambank protection, and wetland/sedimentation basins.

1. Filter strips, as the name implies, are designed to filter out sediments and nutrients and possibly pesticides. They are planted to grasses, legumes, or trees. Design requires laminar flow over a sufficient width of vegetation to be effective. Rarely do these conditions exist. Storms larger than a 2 to 3 year rainfall result in concentrated flow through the filter strip and carry sediment and other material directly into the stream. The strips, if properly designed and installed, would filter out a large percentage of the sand and silt particles. However, this is not the material that reaches the harbor which is predominantly fine silts and clays. In the absence of filter strips, most of the sand and silts are being deposited in the extensive drainage system that exits in the basin. Filter strips would reduce the cost of local drainage maintenance, but would not reduce volumes at the harbor significantly except for the reduction of erosion caused by the conversion of cropland to permanent vegetative cover. However, this would be minor when compared to the total remaining erosion.

To be effective, filter strips would have to be wider than is commonly accepted by the farm manager. Filter strips of the width required to remove clay particles would have to be 100 to 150 feet wide and preferrably planted to trees. No further action is recommended at this time.

- 2. Grass waterways eliminate the erosion caused by concentrated flow of water. A detailed inventory of the amount of grass waterways needed in the basin has not been done. Almost all of the grass waterways installed in the basin are designed to eliminate erosion occurring in gullies that are 6 inches to 3 feet deep that occur on cropland that has a slope of 2 percent or greater. The average length is 800 to 1000 feet long and causes about 15 tons of soil loss per year. About one waterway is needed for every 30 acres. From the 1982 National Resource Inventory, there are 440,000 acres of cropland with slopes above 2 percent. Dividing this by 30 acres per waterway results in 14,700 waterways. About half or more already have been installed. This leaves 7,300. Many of these will be installed as the result of the 1990 Farm Bill (FACTA) which requires concentrated flow erosion to be controlled by 1995 or lose government subsidies. Additional technical assistance is recommend at this time.
- 3. Streambank erosion was estimated in the Maumee Level B Study at 100,000 tons a year. This is 1 percent of the total erosion occurring in the basin. Streambank erosion is dramatic when it occurs, but the relative low velocities of the stream and the flat topography keep the figures from being significant. Most streambank erosion is currently being solved with expensive regrading and rip rap. Unless lower cost solutions can be found to control this type of erosion, the cost per ton saved is too great. No further action is recommended.
- 4. Wetland/sediment basins are an unknown factor. Research reveals the potential to filter out sediments as well as other contaminants. A large number of these (perhaps one every 40 acres) would have to be built before it is anticipated that significant sediment reduction could occur. However, if these are coupled with some type of crop irrigation scheme and an investment return from wildlife can be obtained, their viability is enhanced. It is recommended that a study be conducted to determine the feasibility of this type of approach.

C. Nutrient, Livestock Waste, and Pest Management

These items are a concern to the overall water quality in the stream and Lake Erie; however, they have no direct bearing on the sediment deposition in the harbor and will not be addressed in this report.

Landcover (in acres) and Potential Sediment Reduction 1992

				Maun	nce Basin				
•		Ot	io	India	na	Mich	igan	Tota	als
	Tons/Ac/Yr		USLE Tn	Acres	USLE Tn	Acres	USLE Tn	Acres	USLE Tn
Setaside .	0.12	51,311	6,157	6,535	784	18,408	2,209	76,254	9,150
Wheat	0.57	386,905	220,536	54.273	30,936	12,480	7,114	453,658	258,585
Oats	0.57	22.052	12,570	8,054	4,591	3,298	1,880	33,404	19,040
Hay	0.12	77.048	9.246	10,870	1,304	3,323	399	91,241	10,949
Com Conv.	3.93	508 477	1,998,315	128,863	506,432	40,735	160,089	678,075	2,664,835
Corn Contill.	1.51	245.858	371.246	42,656	64,441	35,615	53,779	324,129	489,435
Soy Bean Conv.	3.93	648.261	2.547,666	121.245	476.493	19,992	78,569	789,498	3,102,727
Soy Bean Contill.	1.51	431,080	650,931	108,684	164,113	21,858	33,006	561,622	848,049
CRP.	0.12	66,078	7,929	48,942	5,873	19,521	2,343	134,541	16,145
TOTALS 1/		2,437,100	5,824,600	530,100	1,254,900	175,200	339,400	3,142,400	7,418,900

Achievable Goal - 70%

	TOTAL 2/	CONV. TILL92	CONS. TILL92	GOAL 70% CON-TILL	AC. NEEDED ABOVE 1992	REDUCT. TONS/YR	REDUCT. 3/ CU. YDS/YR	SAVINGS \$10/YD
CORN SOYBEANS	935,000 1,448,000	687,131 876,030	332,242 548,180	654,500 1,013,600	322,258 465,420	773,419 1,117,008	45,832 66,193	458,322 661,931
TOTAL	2,383,000	1,563,161	880,422	1,668,100	787,678	1,890,427	112,025	1,120,253

Achievable Goal - 80%

-	TOTAL 2/	CONV. TILL92	CONS. TILL92	GOAL 80% CON-TILL	AC, NEEDED ABOVE 1992	REDUCT. TONS/YR	REDUCT. 3/ CU. YDS/YR	SAVINGS \$10/YD
CORN SOYBEANS	935,000 1,448,000	687,131 876,030	332,242 548,180	748,000 1,158,400	415,758 610,220	997,819 1,464,528	59,130 86,787	591,300 867,868
TOTAL	2,383,000	1,563,161	880,422	1,906,400	1,025,978	2,462,347	145,917	1,459,169

Achievable Goal - 90%

	TOTAL 2/	CONV. TILL92	CONS. TILL92	GOAL 90% CON-TILL	AC. NEEDED ABOVE 1992	REDUCT. TONS/YR	REDUCT. 3/ CU.YDS/YR	SAVINGS \$10/YD
CORN SOYBEANS	935,000 1,448,000	687,131 876,030	332,242 548,180	841,500 1,303,200	509,258 755,020	1,222,219 1,812,048	72,428 107,381	724,278 1,073,806
TOTAL	2,383,000	1,563,161	880,422	2,144,700	1,264,278	3,034,267	179,808	1,798,084

^{1/} Totals are rounded.

^{2/} Average of 87-92 acreages

^{3/} Tons*deliver ratio to river (.1)* channel trap efficiency of .32 divided by 1080 pounds per cubic yard of sediment/2000 pound per ton

										1	OC S MC				WHEAT	
<u></u>				บั ว	CORN		1			POL	SUIBEANS					
COUNTY	* in MAUMEE W.S. BASIN	COUNTY	CONVENTIONAL F BASIN US	NAL USLE-TNS	COUNTY	CONSERVTILL	LL USLE-TNS	COUVE	CONVENTIONAL JNTY BASIN	USLE-TNS	COUNTY BAS	L VI	E-TNS	COUNTY	BASIN USLE-TNS	SLE-TNS
												į				766. 38
21 10	-	1 59.207	59.207	232,684	10,007	10,007	15,111	59,624	59,624	234,322	17,929	17,929	27,073	27,617	27,611	15,776
ALLEN	4 6	43 654		135,533	20, 281	16,022	24,193	52,032	41,105	161,544	32,187	25,428	38,396	28,000	22,120	12,608
AUGLAISE	۸۰۰	200		671 53	14 591	14.591	22,032	43,352	43,352	170,373	52,944	52,944	79,945	31,216	31,216	17, 793
DEFIANCE	٠,	11,002		_	45.400	45,400	68,554	42,222	42,222	165,932	49,486	49,486	74,724	16,344	16,344	9,316
FULTON					16 269	13.015	19,653	97.861	78,289	307,675	37,440	29,952	45,228	52,400	41,920	23,894
HANCOCK					21 200	0.10.10.10.10.10.10.10.10.10.10.10.10.10	9 633	54 600	16.052	63,086	41,400	12,172	18,379	30,000	8,820	5,027
HARDIN	0.42 0.7			•	34 773	FCC 75	52,507	54.056	54,056	212,440	40,780	40, 780	61,578	36,128	36,128	20,593
HENRY	٠, ٠				12 162	9 730	14.692	27.799	22,239	87,400	19,459	15,567	23,506	8,382	901'9	3,822
LUCAS	8.0 T		14,030	-	16,152	7 545	11, 194	56.910	26.748	105,118	22,550	10,599	16,004	18,825	8,848	5,043
MERCER	0.47	1 65,996		141 476	16,034	14 941	22 561	67.187	67,187	264,045	43,135	43,135	65, 134	57,673	57,673	32,874
PAULDING	 1 1	666,08 I	50,999		116 FT	13, 390	20,22	82.669	82,669	324,889	32,601	32, 601	49,228	51,560	51,560	29,389
PUTNAM	٦,	1 67,033			26.135	26 135	39.464	59.398	59,398	233,434	46,669	46,669	70,470	33,024	33,024	18,824
VAN WERT		1 46,333	30 650		22,530	22,530	34.020	32,415	32,415	127,391	38,345	38,345	57,901	32,420	32,420	18,479
WILLIAMS	· ·	000 400			39 600	006 6	14,949	81,200	20,300	19,779	54,800	13,700	20,687	45,000	11,250	6,412
MOOD	7.0 T	ο.	'		25,000	1 500	2,265	43.420	2,605	10,238	29,580	1,775	2,680	20,000	1,200	684
SHELBY	0.06	1 30,000			100	27 083	40 895	19.000	10,070	39,575	26,000	13,780	20,808	12,000	6, 630	3,625
HILLSDALE	0.53	1 33,900	106,007	007,211	47,400	8,532	12,883	55,121	9,922	38,993	44,879	8,078	12,198	34,000	6, 120	3,488
LENAMEE	0.10	1 52,000		-	10.000	7,500	11,325	46,000	34,500	135,585	32,000	24,000	36,24p	26,000	19,500	11,115
ADAMS		75,700			18,376	12,863	19,423	76,798	53,759	211,271	52,674	36,872	55, 676	23, 591	16,514	9,413
ALLEN	2.0	1 27 450			9,050	8.779	13,256	31,000	30,070	118,175	36,400	35,308	53,315	14,000	13,580	7,741
DENALB		טטט בנ ו			33,000	5,940	8,969	10,500	1,890	7,428	31,500	5,670	8,562	14,000	2,520	1,436
NOBLE	97.0	7			33,440	6.688	10,099	2,210	442	1,737	19,898	3,980	600 '9	1, 800	1,560	699
STUEBEN WELLS	0.04	1 40,610			22, 143		1,337	14,611	584	2,297	71,339	2,854	4,309	14,964	599	341
						0 0 0 0 0 0 0		אני אפט	540 267		559, 305	431.081		488, 649	386,905	
TOTAL		675,578	// b and a	2,623,173	334, 833	600 1047	455,158	350		3,129,895			855,669			261,076

13

Maumee Basin USLE Basin Erosion 1992 Base Year (Continued)

OATS	OATS	OATS				нах		S	SETASIDE			CRP		TOTALS	GOALS REDUCTION
In MAUMEE GOUNTY BASIN USLE-TNS COUNTY BASIN	USLE-TNS COUNTY	USLE-TNS COUNTY	COUNTY		BASII	ISO N	BASIN USLE-TNS	COUNTY	BASIN USLE-TNS	SLE-TNS	COUNTY	BASIN	USLE-TNS	TONS	TONS 1
								•		,		1 367	788	528,538	144.227
200	3,178 1,811 4,200	1,811 4,200	4,200	200	G.	, 200	50g	3, 114	3, 114	4-6	1001			000 200	121 534
2,844 1,621 14,000	2,844 1,621 14,000	1,621 14,000	14,000	000	ä	1,060	1,327	2, 935	2,319	278	8, 431	6, 660	N 6	370,200	בשר רנו
913 6,800	1,601 913 6,800	913 6,800	6,800	008		6,800	816	3, 456	3,456	415	12,085	12,085	1,450	360,909	157,533
908 518 3,500	908 518 3,500	518 3,500	3,500	200		3,500	420	14,771	14,71	1,773	3, 384	2002	000	400,400F	169 445
502 5,000	880 502 5,000	502 5,000	2,000	000		4,000	480	4,734	3, 787	6	2 (2)	V 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	100	153 111	47 420
947 540 5,700	947 540 5,700	540 5,700	5,700	700		L, 676	201	0000	1,4/0	9/1	404	576	197	523,009	167,640
750 750 421 8,200	750 421 8,200	421 8,200	8,200	007	ю	007	106	300	000	11.5	248	198	24	185,292	53,339
0.1 1 0 000 3 750 0 143 18.600	007*T 95k 000	001,11 964 C	18.600	007	-	8.742	1.049	4,367	2.052	246	933	439	53	262,951	74,813
1 280 730 6.900	1 280 730 6.900	730 6-900	006 '9	006	, 10	6, 900	828	3,400	3,400	408	2,128	2,128	255	528,310	174,482
2,000 1,140 10,800	2,000 1,140 10,800	1.140 10,800	10,800	008	H	008.0	1,296	2,262	2,262	271	885	882	106	691,943	197,775
1,000 570 3,900	1,000 570 3,900	570 3,900	3,900	900	m	3,900	468	3,287	3,287	394	109	601	72	554,439	166,912
1,180 673 4,800	1,180 673 4,800	673 4,800	4,800	800	4	, 800	576	4,800	4,800	576	28,770	28,770	3,452	359, 593	146,183
625 356 3,	625 356 3,	356 3,	9,			900	108	5,622	1,406	169	262	99	ස	179,846	54,560
1 5,000 300 171 11,	300 171 11,	171 11,	11,	11,500		069	83	3,800	228	27	718	£.	R	23, 228	909'/
1 5,000 2,650 1,510 2,500	2,650 1,510 2,500	1,510 2,500	2,500	00	•	1,325	159	30,700	16,271	1,953	29, 700	15,741	1,	222, 683	CHT TA
1 3,600 648 369 11,098	648 369 11,098	369 11,098	11,098	98		1,198	240	11,870	2,137	256	21,000	3,780		116, 702	40,037
1 4,800 3,600 2,052 7,500	3,600 2,052 7,500	2,052 7,500	2,052 7,500	00	•	5, 625	675	2,750	2,063	248	4,053	3,040		352, 938	104,514
1 1,800 1,260 718 2,180	1,260 718 2,180	718 2,180	718 2,180	80		1,526	183	1,978	1,385	166	9,089	6,362	763	999, CDC	13/,040
1 2,500 2,425 1,382 2,500	2,425 1,382 2,500	1,382 2,500	2,500	200		2, 425	291	2,000	1,940	233	32,000	31,040	m"	304,665	114,009
1 2,500 450 257 4,	450 257 4,	257 4,	4	4,000		720	96	1,089	196	24	17,210	3,098		50,478	19,618
1 1,400 280 160 1,	280 160 1,	160 1,	٦,	1,500		300	36	3,500	700	84	26,000	5,200	624	26,209	15,616
1 963 39 22 6,	39 22 6,	22 6,	9			274	33	6,275	251	30	5,054	202	24	14,777	5, 484
					1									7,378,162	2,325,543
60,165 35,345 160,652 102,503	35,345 160,	160,	160,	160,652 102	102		12,300	84,340	57,846	6,942	168,072	168,072 115,020	13,802	7,378,162	
127 (07	, 54 (03					•	1								

1/ 0.75 USLE Tons Per Cropland Acre

Toledo Harbor Sediment Reduction Technical (TA) and Financial (FA) Assistance Needed

ГҮРЕ	ONE	TWO	THREE	YEARS FOUR	FIVE	SIX	7-15	16-20	TOTAL
Technical Assistance-\$	-								
3-Planners 1-Engineer Overhead	105000 46000 22680	110250 48300 23814	115763 50715 25005	121551 53251 26255	127628 55913 27568	134010 58709 28946	0 0 0	0 0 0	714201 312888 154267
1-Administrator Overhead	42000 6300	44100 6615	46305 6946	48620 7293	51051 7658	53604 8041	0 0	0	285 680 42852
SWCD's Included in FA as needed									
Subtotal	221980	233079	244733	2569 70	269818	283309	0	<u>_</u> 0	1509889
Financial Assistance SWCDs A \$.40 per cropland acre in basin - incentive payment	1322520	1322520	1322520	1322520	1322520	1322520	0	0	7935122
B \$.35 per cropland acre - capitilization of maintenance fund	1157205	1157205	1157205	1157205	1157205	1157205	0	0	6943232
Local County Steering Committees (21*\$1000)	21000	21000	21000	21000	21000	0	0	0	105000
Subtotal	2500726	2500726	2500726	2500726	2500726	2479726	0	0	14983355
Total	2722706	2733805	2745459	2757696	2770544	2763035	0	0	16493245

Does not include three SCS Water Quality Coordinators presently in Ohio in the Maummee Basin.

Maumee Valley RC&D Revised Sub Contract Agreement For Toledo Harbor Grant Assistance

Project Title

Marketing Wetlands For Profit

Contract No MWFP - III

Date of Contract September 10, 1998

This sub-contract will serve as an instrument between the USDA/NRCS (provider) and the Maumee Valley RC&D (recipient) of funding for the purpose to execute the terms and conditions as attached.

Name & Address of Sub Contractor:

Maumee Valley RC&D 06825 St. Rt. 66 N., Suite C Defiance, OH 43512

Contracting Organization:

USDA Natural Resources Conservation Service 200 N. High Street, Rm. 522 Columbus, OH 43215

Contracting Site/ Individual:

The scope of work as defined in the terms and conditions will address research needs at the DARA site, the Fred Shininger site, and the Marsh site. Research tabulations will be conducted by partnership management with USDA – Agricultural Research Service, Ohio State University – Ag Engineering, OSU Extension service, and Maumee Valley RC&D

Contract For: A partnership of researchers will be tabulating the water quality impact of established and operational systems.

Place:

Within the Maumee watershed and at constructed WRSIS (Wetland Reservoir Subirrigation Systems) sites in Fulton, Defiance, and Van Wert county.

Sub Contract Price:

Using Corps of Engineer's dollars, the USDA – Natural Resources Conservation Service will sub-contract to the Maumee Valley RC&D for \$25,000. The indirect allowable costs for Maumee Valley RC&D is \$1,200.00

The Contracting Organization, represented by the Officers executing this contract, and the individual, and the sub contractor named above, mutually agree to perform this sub contract in strict accordance with the following:

- The terms and conditions as set forth in the attached.
- Acceptable accounting and business practices

Terms and Conditions For Water Quality Research WRSIS Sites in Defiance, Fulton and Van Wert County

October 1, 1998 ---- September 30, 2001

The Maumee Valley RC&D will utilize up to \$1,200.00 of the \$25,000 grant for indirect costs. The Maumee Valley RC&D in-direct cost rate proposal for grants and contracts will be used as a guide. The object category will include, but not be limited to communications, materials, supplies, meetings, conferences, professional services/activity costs, organization and administrative cost.

The \$23,800 will be used to coordinate research tasks and activities conducted by the co-collaborators.

The duties of the principal collaborators are responsible for research, directions, data recording, laboratory analysis, interpretation, reporting of findings, and conclusions. The collaborators are Dr. Larry Brown, Dr. Norm Fausey, Dr. Barry Allred, and Dr. Dick Cooper.

These grant dollars will be used to hire part time personnel for field work, to gather and deliver samples to The Ohio State University, to help install and monitor instrumentation devices as needed, and to retrofit, repair, and operate existing facilities to meet research needs. This will include travel expenses.

The Maumee Valley RC&D may purchase water quality sampling instruments and/or materials and supplies to operate the facilities. These purchases will be at the recommendation of the technical committee and approved by the RC&D council.

"The US Department of Agriculture (USDA), partnership sponsors, and the Maumee Valley RC&D prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and martial or family status. (Not all prohibited bases apply to all programs.) To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (voice or TDD). USDA is an equal opportunity provider and employer."



LEASEQ

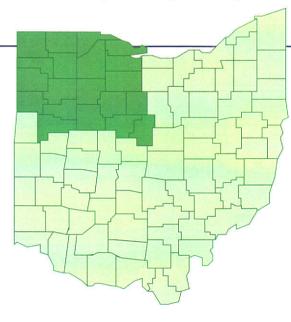
The Lake Erie Agricultural Systems for Environmental Quality Project

Of all the Great Lakes, Lake Erie is the most heavily used. Its watershed supports a population of 11.7 million. More than 10 million Americans rely on Lake Erie as their source of drinking water. Ohio's part of the Lake Erie basin has an economy of more than \$40 billion annually, including lake travel and tourism worth \$3.1 billion and agricultural production worth \$1.6 billion.

Lake Erie is also the most vulnerable of the Great Lakes to pollution. In the early 1970's, she was spoken of as a dying lake because of excess nutrients (eutrophication), industrial pollutants, and bacterial contamination of waters and beaches. Point sources of contamination were adressed first, but it soon became apparent that non-point sources of nutrients, primarily phosphorus of agricultural origin, would have to be reduced to bring Lake Erie back to health.

Since that time, numerous programs have been targeted to the Maumee and Sandusky watersheds in northwest Ohio and adjacent parts of Indiana and Michigan, as part of local, state, and federal efforts to reduce agricultural nonpoint source pollution. Because detailed water quality monitoring of these major Lake Erie tributaries has been underway since 1975, these watersheds offer a unique opportunity to evaluate the linkages between agricultural land use and water quality on a larger scale and over a longer period of time than is possible elsewhere.

The Lake Erie Agricultural Systems for Environmental Quality (LEASEQ) Project, one of nine ASEQ projects nationwide, is a retrospective evaluation of changes in agricultural practices and resulting changes in water quality in the Maumee and Sandusky river watersheds over the twenty year period 1975-1995. LEASEQ is a pioneering attempt to evaluate the success of water quality management efforts on a large watershed scale. The project promises to increase our understanding of the ways pollutants of agricultural origin move through tributary networks into receiving waters, and our ability to minimize these impacts.



LEASEQ Objectives

- Document changes in conservation tillage and other farming practices designed to reduce agricultural pollution
- Evaluate changes in numbers of farms and farm size, in crops, productivity, and soil fertility
- Determine changes in water quality and relate them to changes in agricultural practices
- Examine the possible impact of past climate change on agriculture and water quality
- Clarify the mechanisms of non-point pollutant movement through agricultural watersheds

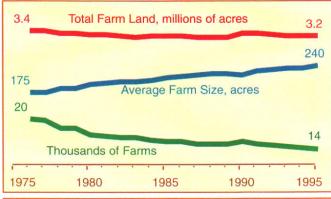


Sediment plume in Lake Erie from the Maumee River

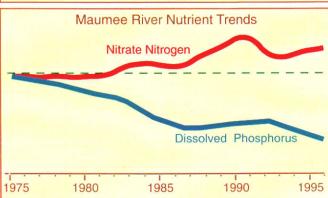
LEASEQ

Conservation tillage techniques, almost unknown in the early 1970's, are now practiced on 1.6 million acres - more than half of the row-crop acres in the LEASEQ study area. No-till cultivation of soybeans accounts for 68% of the total conservation tillage.





■ Agriculture accounts for 88% of the land use in the study area. The number of farms has decreased by 37% during the two decades of the study, but the average farm size has increased by 53%. The total agricultural acreage is almost unchanged. Soybean acreage has increased from 38% to 48% of this total, while corn has decreased from 37% to 32% and wheat from 18% to 15%.



■ Total phosphorus concentrations in the rivers have been reduced by about 40%, while dissolved phosphorus, most available to algae, has been reduced by 75%. Sediment concentrations are down by about 20%. However, nitrate concentrations have increased, for reasons which are not well understood. Use of chemical fertilizers peaked in the early 1980's. Since then, phosphorus fertilizer sales have decreased more than 40% while nitrate sales have decreased by about 10%.

Reductions of sediment and phosphorus concentrations in the rivers and in Lake Erie represent significant improvements in the health of these waters. The magnitude of the changes we have documented in the LEASEQ watersheds, and their timing relative to changes in tillage and fertilizer use, demonstrate that they are largely due to improved agricultural stewardship of the land and water resources in the Lake Erie basin.



LEASEQ is a collaborative research effort by The Ohio State University, the Heidelberg College Water Quality Laboratory, and Case Western University, with support from the USDA Cooperative State Research, Education, and Extension Service (CSREES). This publication was developed and funded cooperatively by the LEASEQ project and the Ohio Management Systems Evaluation Area Project (Ohio MSEA).

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ANALYSIS

OF

CONSERVATION BUFFER EFFCTIVENESS

FOR

TOLEDO HARBOR PROJECT

PREPARED BY

NATURAL RESOURCES CONSERVTION SERVICE

JULY 15, 1998

STEVE DAVIS

RESOURCE CONSERVATIONIST

ANALYSIS OF CONSERVATION BUFFER EFFECTIVENESS

FOR

TOLEDO HARBOR PROJECT

PURPOSE

This analysis evaluates the effect that widespread installation of conservation buffers in the Maumee Watershed would have on the reduction of dredging in Toledo Harbor. This analysis is prepared as part of the Natural Resource Conservation Service Toledo Harbor Demonstration Project final report submitted to the U. S. Army Corps of Engineers. The objectives of this analysis are to:

- Quantify the effect of conservation buffers on sediment reduction in the harbor.
- Determine the average savings in yards of dredging saved per acre of buffer installed
- Evaluate the cumulative effect that widespread installation of buffers would have on project goals.

BACKGROUND INFORMATION

As part of the Toledo Harbor Project Phase III plan, NRCS initiated a pilot project to demonstrative effectiveness of using land treatment to reduce upland erosion which would result in less sediment delivery into the harbor. The pilot project is the first phase of a multiyear plan to reduce sedimentation and dredging.

The plan contains a goal of reducing sedimentation by 130,000 cubic yards annually through erosion control. The 130,000 cubic yards represents agriculture's contribution to the overall goal of sediment reduction. In addition to the agricultural component, there are several other components in the phase III plan, which also contribute to dredging reduction.

The original plan for achieving 130,000 cubic yards of agricultural related sediment reduction was based on achieving the goal of using conservation tillage to grow 75% of the corn and soybeans in the watershed.

At the time the initial NRCS plan was prepared in 1992 there was no effective program to promote filter strips (conservation buffers), especially ones of widths that would be effective in sediment removal. Since that time the National Conservation Buffer Initiative has been developed as part of the Continuous Signup provisions of the CRP program. Both of these programs now work in tandem to now make the use of filter and buffer strips more attractive to farmers.

Additionally, the Buffer Initiative contains financial and program incentives to promote filter strips that are more effective in sediment removal. Interest in adopting this practice is increasing in the watershed.

CONSERVATION BUFFER EFFECTIVENESS - RESEARCH INFORMATION

Literature Review

There are numerous studies available which document the effectiveness of conservation buffers. According to David L Correll of the Smithsonian Environmental Research Center there are now over 400 research papers available on the subject. In 1991, Dr. W. Findlay, Scientific Authority, National Soil Conservation Program, University of Guelph, Guelph Ontario, published an extensive and comprehensive review and summary of the current literature on buffer strips (Findlay et.al., 1991). This study summarized over 75 papers that evaluated the effectiveness of buffers. In addition, NRCS geologist Jim Wade has made observations on the effectiveness of filter strips in reducing sedimentation in the Maumee River Watershed. This information was used in compiling this analysis.

Benefits of Buffer strips

The literature review shows that conservation buffers are very effective at trapping sediments, nutrients, pesticides and pathogens. Effective buffers trap and hold these contaminants in the edge of field buffers rather than allowing them to be carried away in the runoff. This analysis will concentrate on the effect buffer strips will have on trapping sediment and the reduction of sediment delivery within the Maumee watershed. Buffer strips that are appropriate in the Maumee Watershed include the conservation practices of grass filter strips, grassed waterways, riparian forest buffers, wetland restoration, and field windbreaks. In addition to the trapping benefits of buffers, there is also a fairly significant benefit of reduced erosion on the buffer acreage itself, as a result of the land use conversion from cropland at an elevated erosion rate to permanent vegetation at a lower erosion rate.

Design Principles and Buffer Effectiveness

Buffer strip effectiveness is highly site specific. It depends on buffer width, site, topography, vegetation, buffer size, buffer configuration and climatic factors. In general, required buffer width

increases as the drainage area increases, the slope of the land increases the particle size decreases, and volume of runoff increases.

Nearly all studies have found a positive effect from buffers. Usually the question is not if the buffer is effective, but what is the level of effectiveness. This analysis is based on what is thought to be the typical buffer condition and buffer effectiveness that will be found in the watershed.

BUFFER EFFECTIVENESS IN THE MAUMEE WATERSHED

The effectiveness of conservation buffers in reducing sediment delivery to the Toledo Harbor will be calculated using four factors. These are:

Trapping Efficiency Factor
Landscape Effectiveness Factor
Watershed Delivery Ratio Factor
Ship Channel Trapping Efficiency Factor

Trapping Efficiency Factor

Trapping efficiency is the measure of the ability of the buffer to hold sediment particles in the buffer zone. It is expressed as a percentage of the sediment (tons) retained in the zone relative to the total sediment entering the buffer zone.

Trapping Efficiency = <u>Tons of Soil Retained in Buffer</u> Total Tons Entering the Buffer

Trapping efficiency is a function of the width of the buffer, amount of uniform flow through the buffer, soil particle composition, and density of vegetation in the buffer, among other things.

There are numerous examples of various trapping efficiencies in the literature. Neibling and Alberts (1979) found that buffer strips ranging from 2 to 16 feet in width removed over 90% of the total sediment. Magette et al. (1987) found that 15 and 30 foot filter strips removed 72% and 86% of the total sediment load respectively. Young (et al. (1980) found that a 90 foot orchard grass buffer strip removed 66% of the total sediment load. Wilson (1967) found that 10 foot was sufficient to remove the maximum percent of sand, 50 foot for silt and 400 foot for clay.

Jim Wade, NRCS geologist, has observed that each acre of filter strip in the Maumee Basin can trap and retain approximately 50 tons of soil per year and still remain viable, but that average annual trapping is less than this, in the range of 25 tons per acre (personal communication).

For the purposes of this analysis, based on the literature review, a trapping efficiency of 50% will be assigned to conservation buffers in the Maumee Watershed. This efficiency assumes a properly designed buffer with a width in the range of 30-45 feet.

Landscape Effectiveness Factor

The proper functioning of a buffer strip for sediment removal requires a shallow uniform flow across the buffer. Buffer effectiveness is reduced where concentrated flow occurs. Because of the topographic nature of the landscape in the Maumee Watershed, the intensively developed drainage systems, and because buffers are installed for a variety of benefits, few buffers will be effective along their entire lengths. For this reason a landscape effectiveness factor has been assigned. The landscape effectiveness factor is a measure of the percent of the total length of buffer that actually provides proper buffering capacity via shallow uniform flow. It is expressed as follows:

Landscape = <u>Length of buffer that effectively filters</u>

Effectiveness Total length of buffer

Factor

For the purpose of this analysis, a landscape effectiveness factor of 50% will be assigned to the typical buffer in the Maumee Watershed.

Thus the overall average buffer effectiveness in the Maumee Watershed will be .25 (25%). This is calculated by multiplying the buffer trapping efficiency (.50) times the landscape effectiveness (.50). The .25 figure represents the percent of the total gross erosion which enters a buffer that the conservation buffer can be expected to trap and hold at the edge of the field.

Watershed Delivery Ratio

M

Not all of the eroded material that leaves, field in the watershed makes it to the Toledo Harbor. Some is captured elsewhere in the field, in the drainage ditches, stream channels, flood plains, etc. The percentage of material that enters the Harbor divided by the total tons of soil that erodes in the watershed is termed the delivery ratio. The previously published NRCS Report, Erosion and Sedimentation Dynamics of the Maumee River Basin, and Their Impact on Toledo Harbor, (February 1993) reports a watershed delivery ratio of 12 percent. This delivery ratio of 12 percent was used for the purposes of this analysis.

The purpose of this analysis is to compare the proposed end of project conditions with various levels of new conservation buffers applied to the 1992 beginning reference condition without the buffers. For this reason the delivery ratio is held constant throughout the analysis. Most of the conservation buffers used in the analysis will be edge of field buffers and the assumption made is that any material which passes through the buffers and leaves the field will travel through the stream system as it did previously.

Trapping Efficiency

Not all of the sediment that the stream system transports to the harbor is deposited in the shipping channel. The previously cited Erosion and Sedimentation Dynamics Report assigned a ship channel trapping efficiency of 32 percent which represents the percent of total sediment that is deposited in the channel. This value of .32 (32%) is used for this analysis.

CALCULATION OF THE CUMULATIVE BUFFER EFFECT

The cumulative effectiveness of one acre of conservation buffer is the product of the four buffer efficiency factors. It is calculated as follows:

Sediment = Reduction (Tons)	Soil Loss in x Buffer Watershed Fa (Tons)	Buffer Trap Efficiency actor		Landscape Effectiveness actor	x	Watershed Delivery Ratio	. X	Ship Channel Trapping Factor
Sediment = Reduction	Soil Loss x	.50	x	.50	x	.12	x	.32
Sediment = Reduction	Soil Loss x Above Buffer	.0096						

WATERSHED ANALYSIS - EFFECT OF BUFFERS

Buffer effectiveness is related to the soil loss of the contributing watershed flowing across each buffer. The procedure used for this analysis was to compare the soil loss for the end of project conditions, with and conservation buffers in place, to the soil loss for the reference year of 1992 without the buffers. The 1993 Erosion and Sedimentation Dynamics Report contained data for agricultural land use, crop acres, USLE erosion rates for each crop and total tons of erosion for each crop. This data was used for the analysis to maintain consistency in terms of effect buffers on the original project goals.

A spreadsheet model was developed which calculated the cubic yard reduction of sedimentation in the harbor when conservation buffers were applied to the 1992 watershed cropping and erosion data. Buffers were applied to 5,15,25, 35, and 50 percent of the agricultural crop fields (minus the hay and 1992 Conservation Reserve Acres). The sediment reduction was calculated by determining how many tons of soil would be retained in the edge of field buffers using the buffer efficiency factors. The result was then multiplied by the delivery ratio and ship channel trapping efficiency to determine how many of those saved tons would have been deposited in the harbor. These tons were converted

to yards using a previously established conversion factor of 1.85 yards of dredging per ton of sediment (Erosion and Sedimentation Report – 1993).

The buffer levels were expressed as a percentage of the agricultural fields in the watershed which were protected by a buffer system. Thus at a buffer level of 5%, five percent of the crop fields (or 5% of the total acres) were protected with buffers. One acre of buffer would be installed for each 15 acres of crop field protected. Thus the total acres of buffers needed could be calculated by multiplying the crop acres in the watershed times the percent of watershed protected with new buffers and dividing by 15.

As buffer acres were applied at various levels, the spreadsheet model credited the increased CRP acres in the watershed and deducted the acres equally from the total corn and soybean acreage. It also calculated the savings due to the change in erosion rates and determined the number of acres of buffers necessary to treat the watershed at each of the various percentage levels, as well as the percentage of watershed acreage that would be occupied by buffers.

The spreadsheet model also simulated the changes in watershed erosion as different levels of conservation tillage were applied to the corn and soybean acreage. It calculated the sediment reduction effects for both the buffer effect and the conservation tillage effect, based on the changes in the erosion rates.

Assumptions in Analysis

The following assumptions were applied in developing the model:

- It was assumed farmers would use the Continuous CRP program to apply most of the buffers.
- It was assumed that farmers would tend to install smaller buffers along drainage ditches and larger buffers along larger streams, rivers and watershed. The minimum width of buffers would be 20 feet and maximum width 100 feet. Consultations with field personnel indicated the average buffer width would be 30-45 feet.
- The average area that could be protected by each acre of buffer was chosen to be 15 acres based on field and soil map observations. It was assumed that in most cases beyond this 15:1 field acres to buffer acres ratio, the buffer would not be effective. Fifteen acres was also used as the average area protected by each buffer to determine how many acres would be occupied by the buffers.
- Buffer trapping efficiency was assumed to be 50% and efficiency was further reduced by a landscape efficiency factor of 50%. This resulted in cumulative buffer efficiency of 25% for the typical buffer in the Maumee watershed. The net result is that it is believed to be a very conservative analysis based on the literature review.

- The buffer acres were projected to come from half corn and half soybeans since those are the
 predominant crops in the watershed. They were deducted equally from conservation and
 conventional tillage.
- The model did not account for any differences in sediment delivery based on the location of buffers within the watershed.
- Buffers applied in the analysis represented "new buffers" beyond what existed in 1992, that either will be installed, or were installed during the NRCS pilot project.

RESULTS

The analysis shows that widespread adoption of conservation buffers could be highly effective in reducing sedimentation into the Toledo Harbor. Buffers can contribute a significant portion of the NRCS goal of 130,000 cubic yards. Applying buffers to 35% of the agricultural acres (at a 60 and 70 % conservation tillage level) would account for 29,000 yards of sediment reduction due to the buffers and would represent approximately 22% of the NRCS goal of 130,000 cubic yards.

The buffer contribution will allow the agricultural goal of 130,000 cubic yards sediment reduction to be achieved at a more moderate level of conservation tillage adoption. Whereas the original phase III plan called for achieving this with a 75% level of conservation tillage in the watershed, this goal can now be achieved with a lesser amount of conservation tillage. This is highly significant. As the percentage of conservation tillage increases in the watershed, it becomes slightly more difficult to convert the remaining acres!

Soil trapped in the buffers is inversely related to the level of conservation tillage applied to the watershed. As conservation tillage increases, conservation buffers provide less sediment reduction because there is less erosion to filter out as opposed to low levels of conservation tillage. However, even at 75 percent conservation tillage levels, buffers provide a significant sediment reduction contribution. The cumulative effect of many buffers is highly significant. Additionally, as conservation tillage increases, buffers become more effective. They do not fill up as quickly and maintain their trapping efficiency longer. Also, the conservation tillage moderates the run-off from the field which further helps buffer efficiency.

Table 1 lists the sediment reduction as various combinations of conservation tillage and conservation buffers are applied to the watershed. Any value below and to the right of the dashed line represents a combination of buffers and conservation tillage that would meet or exceed the agricultural goal in the phase III plan.

The table would indicate that a level of 25-30% of the cropland in conservation buffers, combined with 55-65% of the corn and soybean acres in conservation tillage, will achieve the agricultural goal as called for in the phase II plan. This amount appears highly achievable in the time frame of the

original NRCS Soil Conservation Program, if the resources are provided for accelerated technical assistance (staff) and financial assistance as called for in that plan.

OTHER OBSERVATIONS AND LIMITATIONS OF THIS ANALYSIS

Observations

- The success of this plan is predicated on continuation of the Conservation Reserve Program continuous signup provisions. At this time there is no reason to believe that this program will not be in existence for the time frame of the proposed NRCS project.
- The estimates chosen for the effectiveness of buffers are conservative based on the literature reviewed. Overall savings may be greater than those projected.
- The effectiveness of the buffers is very elastic with respect to the value chosen for the trapping efficiencies. Table 2 contains examples of the contributions of buffers to sediment reduction at various levels of buffer trapping efficiencies.
- Significant savings come from the reduced erosion on the land taken out of production to seed or vegetate the buffer.
- As conservation tillage acres increase in the watershed, there is less gross erosion for each acre of buffer to trap. However, the savings from buffers are still significant, even at the 75% conservation tillage adoption level. Average savings in dredging reduction is .497 yards per acre of buffer at the 1997 conservation tillage level of 43% corn and 60% soybeans, and declines gradually to .383 yards per acre at the 75% conservation tillage adoption level.
- If 35% of the agricultural cropland were buffered by applying new conservation buffers, the acreage needed would by 68,000 acres and occupy approximately 1.6% of the watershed's cropland base.

Limitations

- No provisions are made in the analysis to account for differences in delivery rates do to
 watershed position or distances from the harbor. For simplicity this analysis assumes that
 sediment is contributed uniformly over the watershed.
- This analysis looks only at crop acres as they existed in the 1992 reference year. Recent changes in USDA commodity programs and crop market prices are probably having the effect of increasing corn and soybean acres in the watershed and decreasing small grain acres. This is resulting in more gross erosion, which is increasing sediment delivery to the harbor and increasing the need for conservation buffers and conservation tillage. A more detailed model with updated land use data is needed to track these changes as they occur.

SUMMARY

Conservation buffers can provide a significant portion of the sediment reduction needed to meet the agricultural goals of the Toledo Harbor Study Phase III Report. Each acre of conservation buffer installed would provide from .383 cubic yards to .497 cubic yards of sediment reduction, depending on the level of conservation tillage in the watershed. Based on 1992 crop patterns, the combination of additional conservation buffers on 25% of the cropland acres, 55% conservation tillage corn, and 66% conservation tillage soybeans would provide an estimated sediment reduction of 131,163 cubic yards. This would meet the agricultural goal of 130,000 cubic yards in the Phase III report.

At the end of the pilot project (1997 crop year) 53 percent of the agricultural sediment reduction goal had been reached. This included installation of conservation buffers at the 5% level, conservation tillage corn at the 43 percent level, and conservation tillage soybeans at the 60 percent level.

Buffer effectiveness is very elastic due to the low erosion rates in the watershed. The impact of buffers is dependent on the number of acres applied as well as the value of the trapping efficiency used for each buffer.

As a result of the USDA commodity programs, cropping patterns may be changing to more acres of the most erosive crops. Hence one of the future project efforts should be to update this model to account for year to year changes in crop patterns.

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TOLEDO HARBOR PROJECT

POTENTIAL SEDIMENT REDUCTION FROM BUFFERS (In Cubic Yards)

Conservation Tillage Level		Conserv	ation Buffer Le	vel	
	5%	15%	25%	35%	45%
1997 Pilot Project Corn @ 43% Soybeans @ 60% (with 5% new buffers)	<u>68,776</u>				erden er i skelen i moskenske kred kombolisten er skelenske
corn @ 50% soybeans @ 60% (56% avg.)	80,686	95,443	110,020	124,418	145,678
corn @ 55% soybeans @ 65% (61% avg.)	100,662	114,913	128,985	(142,877)	156,599
corn @ 60% soybeans @ 70% (66% avg.)	120,638	134,483	147,949	161,336	174,542
corn @ 75% soybeans @ 75%	157,682	170,437	183,067	195,516	207,787

Table 1.

		YARDS OREDGING SAVED (TILLAGE)	0 0 0 0 0 47,493 0 62,884	109,631 %
	30%	YARDS OREDGING 1 SAVED (BUFFERS)	73 2,067 152 88 13,478 6,388 14,166 10,334	45.0 % 2.8 %
AVINGS	46,959 109,631 156,589	TONS YARDS YARDS SEDIMENT DREDGING DREDGING SAVED SAVED SAVED (RUFFERS) (TILLAGE)	40 1,117 82 47 7,285 3,453 7,657 5,586	25,383 y buffers =
PROJECTED SAVINGS	BUFFER YDS TILLAGE YDS TOTAL	SHIP CHANNEL SEDIMENTATION & DEL. RATIO FACTORS	0.0384 0.0384 0.0384 0.0384 0.0384 0.0384 0.0384	661,015 0.0384 25,383 Percent of all crop fields buffered = Percent of all agricultural acres occupied by buffers =
		TONS RETAINED IN BUFFERS	1,029 29,091 2,142 1,232 1,89,723 89,921 199,406 145,473	661,015 0.038 Percent of all crop fields buffered = Percent of all agricultural acres occ
	* * *	BUFFER RETENTION EHPICIENCY 0.25	0.25 0.25 0.25 0.25 0.25 0.25 0.25	Percent of a Percent of a
	45 % 55.0 % 65.0 %	TONS BUFFERED @ 45% WS TREATED	4,118 116,363 8,568 4,927 758,893 359,685 797,624 581,892 11,990	2,644,060 d
	CORN	ACRES TOTAL TONS IN EROSION INALYSIS ANALYSIS YEAR YEAR	9,150 258,585 19,040 10,949 1,686,430 799,300 1,772,498 1,293,093	5,875,689 Acres Acres Yards Saved Per Ac Buffer
PROJECTED TREATMENT	爲	< <	76,254 453,658 33,404 91,241 429,117 529,337 451,017 856,353	3,142,422 15 87,499 0.637
TED TRI	% OF FIELDS BUFFERED CONSERVATION TILLAG	PERCENT BY TILLAGE	N/A N/A N/A N/A 45.0% 55.0% 65.0% N/A	
PROJEC	% OF FII	1992 TONS EROSION	9,150 258,585 19,040 10,949 2,664,835 489,435 3,102,727 848,049 16,145	7,418,915 61.2% buffer ent level er
		T/AC SOIL LOSS	0.12 0.57 0.57 0.12 3.93 1.51 1.51 0.12	1.87 acre of treatmo
		1992 ACRES	76,254 453,658 33,404 91,241 678,075 324,129 789,498 561,622 134,541	3,142,422 ILLAGE red by one needed at each acre
		CROP	SETASIDE WHEAT OATS HAY CONV CORN CONV BEANS CONTILL BEANS CRP	AVG % CONS TILLAGE 61.2% Avg area protected by one acre of buffer Acres of buffers needed at treatment level Yards saved for each acre of buffer

TOLEDO HARBOR PROJECT

HARBOR PROJECT	ANALYSIS OF CO	ONSERVATION B	SIS OF CONSERVATION BUFFERS AND CONSERVATION TILLAGE	ERVATI	ON TILLAGE
PROJECTED TREATMENT	REATMENT		PROJECTED SAVINGS	VINGS	•
% OF FIELDS BUFFERED CONSERVATION TILLAGE	UFFERED N TILLAGE CORN BEANS	35 % 55.0 % 65.0 %	BUFFER YDS TILLAGE YDS TOTAL	36,838 106,039 142,877	26% 74%

YARDS SREDGING SAVED (TILLAGE)	00	. 0	0	0	45,615	0	61,005	-580	106,039		
YARDS OREDGING I SAVED BUFFERS)	57	118	89	10,602	5,014	11,137	8,083	151	36,838		
TONS YARDS YARDS I SEDIMENT DREDGING DREDGING SAVED SAVED SAVED (BUFFERS) (TILLAGE)	31	3	37	5,731	2,710	6,020	4,369	82	19,912		
SHIP CHANNEL SEDIMENTATION & DEL. RATIO FACTORS	0.0384	0.0384	0.0384	0.0384	0.0384	0.0384	0.0384	0.0384	0,0384		
TONS RETAINED IN BUFFERS	801	1,666	958	149,234	70,581	156,765	113,788	2,127	518,546		
BUFFER RETENTION EFFICIENCY 0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25			
TONS BUFFERED @ 35% WS TREATED	3,203	6.664	3,832	596,937	282,324	627,061	455,152	8,509	2,074,186		
PERCENT ACRES TOTAL TONS BY IN EROSION F ITLLAGE ANALYSIS ANALYSIS YEAR YEAR	9,150	19.040	10,949	1,705,534	806,640	1,791,602	1,300,433	24,312	5,926,244		
ACRES 1 IN ANALYSIS YEAR	76,254	33,404	91,241	433,978	534,198	455,878	861,214	202,596	3,142,422		
PERCENT BY TILLAGE	N/A			·			_				
1992 TONS EROSION	9,150	19,040	10,949	2,664,835	489,435	3,102,727	848,049	16,145	7,418,915	61.1%	
T/AC SOIL LOSS	0.12	0.57	0.12	3.93	1.51	3.93	1.51	0.12	1.89		
1992 ACRES	76,254								3,142,422	ILLAGE	
CROP	SETASIDE	OATS	HAY	CONV CORN	CONTILL CORN	CONV BEANS	CONTILL BEANS	CRP	TOTALS / AVG. 3,142,422	AVG % CONS TILLAGE	

35.0 % 2.2 %

Percent of all agricultural acres occupied by buffers =

Per Ac Buffer Yards Saved Acres Acres

Percent of all crop fields buffered =

15 68,055 0.541

Acres of buffers needed at treatment level Yards saved for each acre of buffer Avg area protected by one acre of buffer

		YARDS OREDGING SAVED (TILLAGE)	0 0 0 0 43,736 0 59,126	102,448	% %
PROJECTED SAVINGS	21% 79%	YARDS OREDGING S SAVED (BUFFERS)	41 1,148 85 49 7,657 3,614 8,040 5,807 98	26,537	25.0 %
	26,537 102,448 128,985	TONS YARDS YARDS SEDIMENT DREDGING SAVED SAVED (BUFFERS) (TILLAGE)	22 621 46 4,139 1,954 4,346 3,139 3,139	14,344	y buffers ==
	BUFFER YDS TILLAGE YDS TOTAL	SHIP CHANNEL SEDIMENTATION & DEL. RATIO FACTORS	0.0384 0.0384 0.0384 0.0384 0.0384 0.0384 0.0384	0.0384	Percent of all crop fields buffered = Percent of all agricultural acres occupied by buffers =
	:	BUFFER TONS RETENTION RETAINED EFFICIENCY IN BUFFERS 0.25	572 16,162 1,190 684 107,790 50,874 113,169 81,736	373,550	Percent of all crop fields buffered = Percent of all agricultural acres occ
PROJECTED TREATMENT	25 % 55.0 % 65.0 %	BUFFER RETENTION EFFICIENCY 0.25	0.25 0.25 0.25 0.25 0.25 0.25 0.25		Percent of a Percent of a
		TONS BUFFERED @ 25% WS TREATED	2,288 64,646 4,760 2,737 431,159 203,495 452,676 326,943 5,495	1,494,200	ة و
	% OF FIELDS BUFFERED CONSERVATION TILLAGE CORN BEANS	ACRES TOTAL TONS IN EROSION E NALYSIS ANALYSIS YEAR YEAR V	9,150 258,585 19,040 10,949 1,724,638 813,980 1,810,705 1,307,773 21,978	5,976,799	Acres Acres Yards Saved Per Ac Buffer
		∢	76,254 453,658 33,404 91,241 438,839 539,060 460,739 866,075	3,142,422	15 48,611 0.546
		PERCENT BY TILLAGE	N/A N/A N/A N/A 45.0% 55.0% 55.0% 135.0%		
		1992 TONS EROSION	9,150 258,585 19,040 10,949 2,664,835 489,435 3,102,727 848,049 16,145	7,418,915	buffer ent level er
		T/AC SOIL, LOSS	0.12 0.57 0.57 0.12 3.93 1.51 3.93 1.51	1.90	acre of treatm of buff
		1992 ACRES	76,254 453,658 33,404 91,241 678,075 324,129 789,498 561,622 134,541	3,142,422 ILLAGE	ted by one needed at each acre
		CROP	SETASIDE WHEAT OATS HAY CONV CORN CONTILL CORN CONV BEANS CONTILL BEANS	TOTALS / AVG. 3,142,42: AVG % CONS TILLAGE	Avg area protected by one acre of buffer Acres of buffers needed at treatment level Yards saved for each acre of buffer

		YARDS DREDGING SAVED (TILLAGE)	0 0 0 0 41,857 0 57,248 -249	. .
PROJECTED TREATMENT	14% 86%	YARDS OREDGING I SAVED (BUFFERS)	24 689 51 29 4,645 2,188 4,875 3,503 16,057	15.0 % 0.9 %
	16,057 98,856 114,913	TONS SEDIMENT I SAVED	13 372 27 16 2,511 1,183 2,635 1,894 2,835 1,894 8,679	/ buffers =
	BUFFER YDS TILLAGE YDS TOTAL	SHIP CHANNEL TONS YARDS YARDS SEDIMENTATION SEDIMENT DREDGING DREDGING & DEL. RATIO SAVED SAVED FACTORS (BUFFERS) (TILLAGE)	0.0384 0.0384 0.0384 0.0384 0.0384 0.0384 0.0384	Percent of all crop fields buffered = Percent of all agricultural acres occupied by buffers =
		TONS RETAINED IN BUFFERS	343 9,697 714 411 65,390 30,800 68,618 49,317 737	Percent of all crop fields buffered == Percent of all agricultural acres occ
	15 % 55.0 % 65.0 %	BUFFER RETENTION EFFICIENCY 0.25	0.25 0.25 0.25 0.25 0.25 0.25 0.25	Percent of al Percent of al
		TONS BUFFERED (@, 15% WS TREATED	1,373 38,788 2,856 1,642 261,561 123,198 274,471 197,267 2,947	~ =
	% OF FIELDS BUFFERED CONSERVATION TILLAGE CORN BEANS	ACRES TOTAL TONS IN EROSION I NALYSIS ANALYSIS YEAR YEAR	9,150 258,585 19,040 10,949 1,743,742 821,320 1,829,809 1,315,114 19,645	Acres Acres Yards Saved Per Ac Buffer
			76,254 453,658 33,404 91,241 443,700 543,921 465,600 870,936 163,707	15 29,166 0.661
	% OF FIELDS BUFFERED CONSERVATION TILLAG	PERCENT BY TILLAGE /	N/A N/A N/A N/A 55.0% 35.0% 65.0% N/A	
	% OF FII CONSER	1992 TONS EROSION	9,150 258,585 19,040 10,949 2,664,835 489,435 3,102,727 848,049 16,145 7,418,915	buffer at level r
		T/AC SOIL LOSS	0.12 0.57 0.57 0.12 3.93 1.51 0.12 1.92	acre of treatme of buffe
		1992 ACRES	76,254 453,658 33,404 91,241 678,075 324,129 789,498 561,622 134,541 3,142,422	ed by one needed at each acre o
	· .	CROP	SETASIDE 76,25 WHEAT 453,65 OATS 33,40 HAY 91,24 CONV CORN 678,07 CONTILL CORN 324,12 CONTILL BEANS 789,49 CONTILL BEANS 561,62 CRP 134,54 AVG % CONS TILLAGE	Avg area protected by one acre of buffer Acres of buffers needed at treatment level Yards saved for each acre of buffer

		YARDS DREDGING SAVED (TILLAGE)	0 0 0 39,979 55,369 -83	%
AVINGS	5% 95%	YARDS OREDGING SAVED (BUFFERS)	8 230 17 10 1,565 736 1,642 1,174 15 15 15	5.0 % 0.3 %
	5,397 95,265 100,662	TONS SEDIMENT I SAVED (124 124 9 846 398 887 635 2,917	y buffers =
PROJECTED SAVINGS	BUFFER YDS TILLAGE YDS TOTAL	SHIP CHANNEL TONS YARDS SEDIMENTATION SEDIMENT DREDGING & DEL. RATIO SAVED SAVED FACTORS (BUFFERS)	0.0384 0.0384 0.0384 0.0384 0.0384 0.0384 0.0384 0.0384	Percent of all crop fields buffered = Percent of all agricultural acres occupied by buffers =
		TONS RETAINED IN BUFFERS	114 3,232 238 137 22,036 10,358 23,111 16,531 216 75,974	Percent of all crop fields buffered = Percent of all agricultural acres οcα
	% % %	BUFFER RETENTION EFFICIENCY 0.25	0.25 0.25 0.25 0.25 0.25 0.25	Percent of a Percent of a
PROJECTED TREATMENT	5 % 55.0 % 65.0 %	TONS BUFFERED (Ø, 5% WS TREATED	458 12,929 952 88,142 41,433 92,446 66,123 866	ъ т
	% OF FIELDS BUFFERED CONSERVATION TILLAGE CORN BEANS	ACRES TOTAL TONS IN EROSION I ALYSIS ANALYSIS YEAR YEAR	9,150 258,585 19,040 10,949 1,762,846 828,661 1,848,913 1,322,454 17,312	Acres Acres Yards Saved Per Ac Buffer
		ACRES 1 IN ANALYSIS YEAR	76,254 453,658 33,404 91,241 448,561 548,782 470,461 875,797 144,263	15 9,722 0.665
TED TRE	% OF FIELDS BUFFERED CONSERVATION TILLAG	1992 PERCENT ACRES 'TONS BY IN EROSION TILLAGE ANALYSIS YEAR	N/A N/A N/A 45.0% 55.0% 35.0% 65.0% N/A	
PROJEC	% OF FII CONSER	1992 TONS EROSION	9,150 258,585 19,040 10,949 2,664,835 489,435 3,102,727 848,049 16,145 7,418,915	buffer ent level er
		T/AC SOIL LOSS	0.12 0.57 0.57 0.12 3.93 1.51 1.51 0.12	acre of treatm of buff
		1992 ACRES	76,254 453,658 33,404 91,241 678,075 324,129 789,498 561,622 134,541 3,142,422	ted by one needed at each acre
		CROP	SETASIDE 76,25 WHEAT 453,65 OATS 33,40 HAY 91,24 CONV CORN 678,07 CONTILL CORN 324,12 CONTILL BEANS 789,49 CONTILL BEANS 789,49 CONTILL BEANS 134,54 TOTALS / AVG 3,142,42	Avg area protected by one acre of buffer Acres of buffers needed at treatment level Yards saved for each acre of buffer

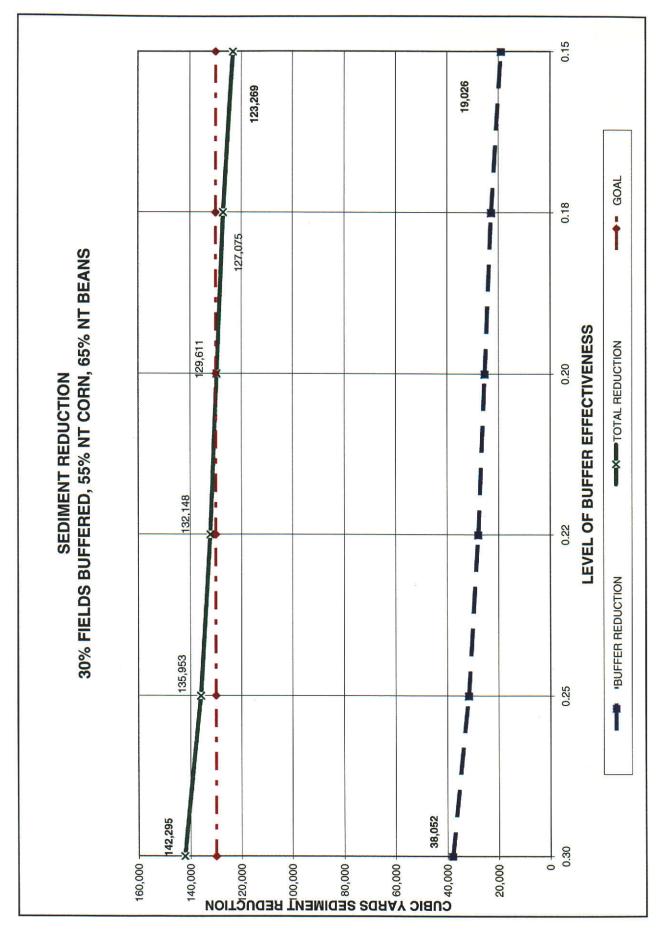


TABLE 2

APPENDIX 5

Comments & Evaluations Received

from

Toledo Harbor Project

County Steering Committees

Question 1 What Were The Positive Aspects And The Accomplishments Of The Project?

Worked with some new individuals who were attracted to some new programs

It allowed districts to come up with innovative projects on their own.

A reduction in sediment entering our streams. A better awareness of dredging in the Toledo Harbor and the cost associated with it.

The Sediment Committee's were a great idea. These groups when working properly help set goals and objectives. The Sediment Committee in turn helped sell the project to the landowners.

The SWCD Board and local cooperators became actively involved in the project. They became more informed regarding the problems being created in the harbor. It gave the staff a door opener with landowners and provided and opportunity to work with more landowners.

The opportunity to work with new landowners in the northern part of our counties Maumee River Basin area. Many individuals have become active participants.

The sediment committee resulted in strengthening of existing partnerships and the advancement of the District's overall watershed program.

That the local District, through the Sediment Reduction Committee, was able to develop our own plan and identify practices that will work for our county.

The project had strength through its local leadership process

Question 1 (Continued)

A positive aspect of the program was the promotion of the benefits of conservation tillage, specifically no-till corn and zone till corn.

We were able to partner with The Andersons and BASF corporation for several programs.

Flexibility, we determined aspects of what we would do locally.

Provided funds to install filter strips and use conservation tillage. In our county provided a conservation system rather than individual practices. Provided flexibility in developing programs for local needs and the target area was decided by the local committee.

The project made individuals in the affected area aware of problems of sedimentation existing even on the relatively flat soils found in most areas of the Maumee Basin. One of the most effective tools used was the involvement of local individuals in the Project Steering Committees.

Some new techniques were tried and established methods supported. New things were discussed that were in question by some producers, were supported by producers who had found them to be effective.

The filter strips installed do a good job of keeping sediment out of the water, gives better access along ditch banks, and gives deer a place to walk instead of in the standing crops. An area that I had problems with surface water cutting the streambank, the added width of the filter strip solved the problem.

The filter strips made a showcase for streambank protection. I had several neighbors comment that all ditches should have this type of protection.

Question 2 What Were The Negative Experiences and/or Limitations Of The Project?

Lack of funds to do more conservation.

Some counties were short on staffing (NRCS & Districts). This hurt the implementation and follow-up documentation for each project.

A low amount of funds available to implement projects. With additional funding a grater impact of sediment reduction and water quality could be tracked.

Question 2 (Continued)

The timing of the project was terrible. It conflicted with existing efforts, especially staff time, on two existing watershed initiatives, NRCS's locally led process and CRP program signups.

No negative experiences. We felt the project was successful. Success wasn't hindered by limitations- funding was the only limitation.

The major limitation to the project was that it was not fully funded. This left the committee with a 3 year plan of work with no funding to implement the remaining portions,

Unpredictability of funding and the future of the project. It is difficult to sell project on large scale basis with no long term resources or guarantee of funding.

There wasn't enough funding for this county to put much effort into it.

Lack of organization by the project coordinator in regard to a defined way to complete paperwork and to apply for funding.

Uncertainty of project funding and difficulty in working with project coordinator.

Our long term demonstration is ongoing. We are just getting a good start. Hopefully it will be successful!

In the past we were asked for local input and then the project coordinator would pressure districts to implement his priorities.

Needed better information on grant guidelines and more structured guidelines to begin with.

Not enough money was allocated to carry out the program to its full potential. Not enough staff for the technical assistance.

Some local committees had difficulty forming consensus on what specifically was needed.

Relying on additional NRCS personnel to plan and oversee the project without additional technical assistance. They were already behind on the assistance requests and this project just added more work to the stack!

Although not used to its fullest potential, the educational component of the project was beneficial. This should have been a major component instead of the cost share aspect.

Question 2 (Continued)

The project ended with no real record of its effectiveness reaching the people involved. Suddenly there was no more funding to continue efforts or determine results. While I feel some of the things attempted have had a positive impact I have not seen any proof.

Too short of duration, uncertainty of funding always loomed overhead and diminished enthusiasm for the project.

This project lacked the manpower and funding to get out in the field and reach its full potential. This type of effort can not have a long term impact if it doesn't exist long enough to document the effect of the practices explored and tried,

We had no problems spending the initial funds, funding levels were somewhat limiting. Project guidance seemed to be very loose, especially since it was hindered by having to deal with three states and numerous counties.

Ouestion 3 What Are Suggestions Or Ideas For Improving The Project?

Continue and increase financial support.

Local involvement should be continued

Adequate funding is needed to provide sufficient staff in the field to provide follow-up and support efforts.

Have improved communication from the coordinator to the participating offices.

In order to effectively carry out this program it needs to have up front funding; Provide work teams to assist with projects where there is limited staffing.

Need long term commitment of funding.

Perhaps more emphasis on public education of the non-farm sector would be appropriate.

Commitment to better follow-up and progress reporting is essential. We need to report project accomplishments not only to the agencies that funded the project, but to all project participants and to the general public.

Some of the staffers that worked on the project appear to be "burnt out" on the project. If they don't see a value don't fund them. Make people apply for funds and prove their willingness to ensue a successful program.

Pick up ideas that worked and offer them to other counties throughout the watershed.

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